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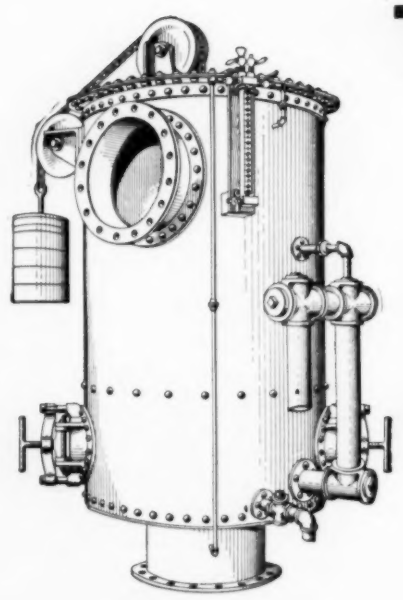

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POSSIBLE ECONOMIES FROM THE USE OF EXHAUST STEAM IN A WATER GAS PLANT.

[From a paper prepared by S. A. REINHARD and C. A. SCHNERR, for Illinois Gas Association.]

The use of exhaust steam has been given considerable attention in the last few years by steam engineers generally. It is of special interest to Public Utility Corporations, such as the gas and electric industries for various reasons. Raw materials are steadily increasing in price, and the cost of labor is likewise rising year by year, while rates for the finished products are constantly on a downward grade; so that gas and electric companies have been obliged to follow a policy of strict economy, and economical plant operation is, therefore, a subject of vital importance to every gas and electric man.

Exhaust steam has long been used for various purposes such as heating boiler feed water and heating buildings. It has remained, however, for the turbine manufacturers and gas men to find other more important uses for exhaust steam, and it can now be said that an exhaust head directly from an engine or pump to the atmosphere should have no place in a modern plant. Numerous experiments have been made on the utilization of waste gases from generators, and although the energy recovered in waste heat boilers is considerable, it can hardly compare with the available energy that can be recovered from the exhaust steam in our plants.

It is the object of this paper to discuss various methods of utilizing exhaust steam in use at the present time; to outline the work done along these lines, and to give some of the results obtained under operating conditions. The first part will deal with exhaust steam turbines and all other uses of exhaust steam other than gasmaking. The second part will be devoted to the making of water gas with both wet and superheated exhaust, and will no doubt be the more interesting of the two from a gas man's standpoint.

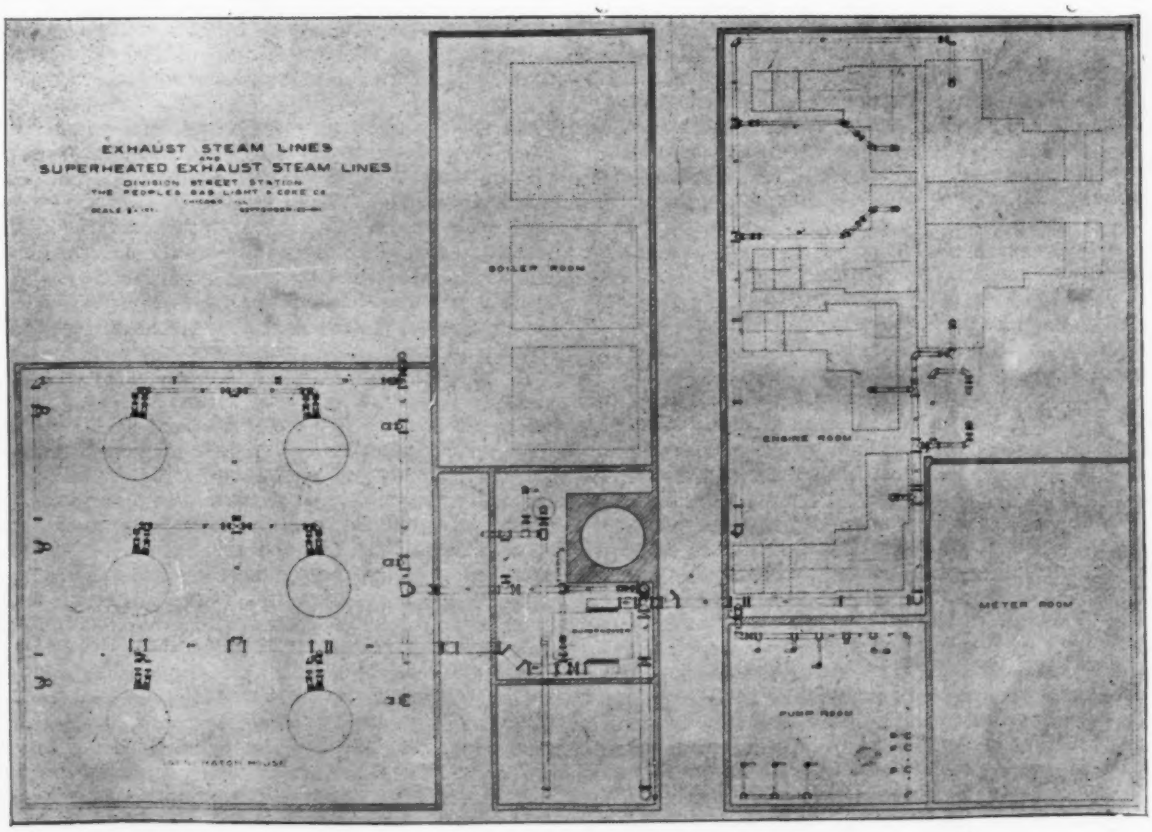

Fig. 1.—Layout of Exhaust Steam Mains.

Exhaust for Heating.—It will hardly be necessary to more than just mention the ordinary uses of exhaust steam, such as heating feed water, heating buildings, etc. We are all familiar with the methods and appliances used for these purposes. So long as we have heat we have a source of stored up energy which only awaits

the proper mechanism to convert it into work. Obviously the simplest and most efficient use for exhaust is for heating purposes of some sort.

For an economical application of exhaust steam no method approaches in efficiency its use to heat feed water. The heater, if properly constructed and operated, will require about 15% of the total exhaust steam of the plant to preheat the boiler feed water, and about 80% of the thermal efficiency of this steam is utilized, or, in other words, most of the B. T. U.'s in the steam are recovered. Remember that whatever other uses are made of exhaust steam it is of primary importance that sufficient be set aside to heat the boiler feed water.

The next method in simplicity of application is the use of exhaust to heat the buildings of the plant. This should especially commend itself to the manager of a small plant where the amount of exhaust steam hardly justifies the installation of expensive apparatus. The objectionable feature is that larger sized piping must be used to get the same effect than when live steam is used.

Under this head might be mentioned the heating of holder cups in cold weather by water preheated by exhaust steam. This is done by having a tank similar to a feed water heater and pumping the water to the holder cups and through a circulating system in order to use the same water continuously.

Exhaust Steam Turbines.—The low pressure turbine has become such an important factor in power plant work that a brief survey of its possibilities and uses should be interesting and profitable.

While the low pressure turbine has been mostly used for increasing the capacity in non-condensing plants, there are installations in condensing plants which are perhaps more interesting. The low pressure turbine may be economically applied for increasing capacity in all types of plants using steam power, irrespective of working conditions or locations of the apparatus. As the low pressure works with substantially half the heat drop of the high pressure condensing turbine, its construction is simpler; as the volumes of steam passing are greater, larger blade passages are permitted, all of which conduces to simplicity and ruggedness of design.

In any contemplated installation some questions naturally arise: Is there enough steam for the low pressure turbine and has its quantity been properly estimated? Although for preliminary purposes a sufficient accurate approximation of the available quantity of steam may be made, the use of indicator cards from the high pressure machines is advisable. Steam meters furnish another method of arriving at the desired figures, although the preferable procedure is a complete test of the boiler plant. It is advisable to make a deduction of about 10% from the apparently available quantity to allow for moisture in the exhaust.

Another question is the governing of the turbine. If a governor is installed, should it control the inlet to the turbine alone, or should it be connected to a valve in the low pressure line permitting a portion of this steam to pass directly to the condenser and thus lower the back pressure on the engines due to low load on the turbine? Should the turbine be complicated and its efficiency somewhat reduced by the addition of a high pressure element so as to operate with passable efficiency with steam direct from the boilers if necessary? Finally, should the low pressure turbine be installed at all? Do the conditions of the engines warrant the installation of a low pressure turbine or would best results be obtained by installing new high pressure equipment?

The primary consideration in any low pressure installation is to ensure that the turbine will receive sufficient steam to meet all demands for load; and that all the available exhaust steam is utilized either in the turbine or in some more efficient manner. The installation should, therefore, be so arranged that there will be no possibility of exhaust steam escaping to the atmosphere. While the low pressure turbine is an exceedingly efficient machine mechanically and affords an economical means of using a by-product often wasted, its absolute thermal efficiency is only approximately 10 per cent.

Take, then, a gas plant in which additional engine equipment is needed and in which sufficent exhaust is found to run a low pressure unit. An ideal case would be a combination gas and electric property either linked together, or, better still, run from a common boiler room. The equipment needed may be additional electric generator apparatus, or additional blowers for the water gas machines. Either one or both of these could easily be installed, if enough exhaust steam is available. It might be that if high pressure engines or turbines were installed additional boilers would be needed In a case like this considerable saving could be effected by installing low pressure turbines, in preference to high pressure engines and possibly one or two additional boilers.

In the early days of the low pressure turbine it was thought advisable that the source of exhaust supply be fairly concentrated and close to the location for the turbine. This is no longer necessary, quite a few installations take the exhaust from widely separated sources all over the plant through an extensive piping system to a low pressure turbine in a central engine room. This piping must, of course, be well covered and should include all sources of exhaust supply, even to the smallest pumps. The system should terminate in a header and have an automatic relief valve opening to the atmosphere, preferably 3 to 5 pounds. An oil and moisture separator should also be put on the inlet of the turbine. Wet steam will do no harm of itself, but has a bad effect on the economy of the turbine, since its presence acts as a brake. The oil in the exhaust sometimes chokes the passage through the blades. Pure clean oil of itself would pass a turbine without accumulating, but if the boilers foam, discharging solid matter with the steam, this mixes with the oil, forming a deposit which is difficult to remove.

Where sufficient exhaust steam is available for operating a low pressure turbine, the simple design without governor is preferable. Adequate provision should be made in the plant to insure continuous service. With the low pressure turbine constituting only a small part of the capacity, the reduction of its output due to a deficiency in the exhaust steam supply will occasion little embarrassment in operation, but if the addition of the low pressure turbine doubles the possible output and the actual load is increased correspondingly, then some other provision should be made. This is ideally secured by the use of a throttling live steam admission valve. In well operated plants the occasion for operating the low pressure turbine on live steam is rare, and consequently the consideration of economy during such periods may be ignored. It would hardly over tax the capacity of the boiler plant in any event, as the turbine would continue to develop power with about the same steam consumption as previously, improving probably 6% from the resulting superheating. Very often a sudden decrease in steam consumption causes the boilers to release their pressure into the atmosphere, and in a case of this kind the low pressure turbine equipped with an auxiliary live steam valve will absorb the steam otherwise wasted. Hence the controlling of this valve performs a function parallel to the recuperator or heat economizer, with greater simplicity.

Very often there is a complete cessation of the flow of exhaust steam. To continue the operation of the turbine under such conditions without live steam, a regenerator or heat storage means is often resorted to. The regenerator consists generally of a large vessel partially filled with water through which the exhaust steam passes from the engines, the water being thus maintained at the temperature of the steam. A regenerator is usually designed to operate between the limits of atmospheric pressure and five or six pounds gauge, the lower limit being chosen to prevent air leakage into the system.

As an illustration of the action of a regenerator, assume that the pressure limits for its operation are 14.7 pounds and 20 pounds absolute, that is atmospheric pressure and 5 pounds gauge. The corresponding temperatures will be 212° F. and 228° F. Assume that the water in the regenerator is at 212° F., and the steam at a corresponding pressure, and that the steam from the engines is exactly equal to the requirements of the turbine. So long as this condition is maintained, the temperatures of the steam and water are in equilibrium and no interchange of heat takes place. If now, the load on the engine and the steam it discharges increase, while the demand of the turbine remains constant, then the pressure and temperature of the steam within the regenerator will rise, resulting in an increase in the temperature of the water. As the pressure increases the steam comes in at a temperature higher than the water, and is consequently partially condensed, keeping the temperature of the water equal to that of the steam. This will continue until the pressure in the regenerator reaches 20 pounds absolute, at which the relief valve has been set. Under these conditions each pound of water in the regenerator will have absorbed 16 heat units. Suppose that at this point the flow of exhaust steam from the engines practically ceases. Then the pressure within the regenerator begins to fall, because the turbine continues to draw steam from it. When this pressure approaches 14.7 pounds, the water in the regenerator will evaporate until its temperature corresponds to that of steam at this pressure (212° F.), and each pound of water will have given out 16 heat units, the amount absorbed while the pressure was rising.

In installing a regenerator the important point to determine is the length of time the regenerator will be expected to carry full load on the turbine without any supply of steam from the engines. From this it will be seen that if this time is long the quantity of

water in the regenerator must be large. Usually the mistake is made in making the time element much longer than necessary. Some of the early installations of regenerators provided for six to seven minutes of operation without a supply of exhaust steam. The maximum time of low pressure on the exhaust system in a gas works would not be over three or four minutes, the length of a blast or run on a machine. Considering the cost of regenerators it might in some instances be inadvisable to install an apparatus of this kind; while in cases where conditions warrant an installation of this sort a considerable economy in steam will result.

Heat, which is the source of power in steam, can be converted into work only by expansion of the steam; theoretically the moisture in the exhaust of an engine expanding from 150 pounds gauge to atmospheric pressure is about 15%, but on account of re-evaporation which takes place in the engine cylinders during the expansion part of the stroke, this in practice is found to be nearer 10%, and approximately as much heat is available for doing work from atmosphere to 28 inches vacuum, as expanding from 150 pounds gauge to atmospheric pressure.

Tests have shown that there is a reduction of 8% in the steam consumption of a turbine exhausting into a 28-inch vacuum, over the steam consumption with 26-inch vacuum. In other words, for a given amount of exhaust steam 8% more work can be secured by carrying a 28-inch vacuum than by carrying 26 inches. But to maintain the additional 2-inch vacuum nearly twice as much water must be circulated through the condenser, and this means an increase in the cost of condensing apparatus of approximately 40%. Another factor to be considered in running very low vacuum is that of leakage through stuffing boxes, joints, etc. Even a small amount of air getting into the system makes the holding of the vacuum very difficult. To prevent leakage of air through the glands into the turbine, high pressure steam is circulated through them and if there is a leak it will be steam instead of air going through the glands and therefore, does no harm. In some contemplated low pressure turbine installations there may be cases where the engine and turbine loads are very dissimilar, or where there is a great deal more exhaust than is needed by the turbine. This might be the case if a low pressure turbine were used on a blower for a water gas machine operated intermittently. If the surplus steam over that required by the turbine were permitted to escape to the atmosphere, a certain loss in energy is occasioned which might be avoided by a partial vacuum produced on the high pressure apparatus. To satisfy this requirement a governing system has been developed for low pressure turbines which controls the flow of exhaust steam in auch a way as to continually deliver to the turbine the amount of steam necessary to carry its load, and to pass the excess to the condenser. If the load on the turbine is removed the governor acts and the condenser operates directly on the high pressure apparatus. This obviates the necessity of having the high pressure engine operate continually at the back pressure required to carry the maximum load on the turbine, as is the case where the governor controls only the supply to the low pressure turbine. This method of governing increases the efficiency of the high pressure engines when the turbine is shut down, for they are then practically running condensing.

The ideal application of a low pressure turbine is when it serves as a low pressure cylinder of a simple engine, with all the unnecessary parts, such as regulator, governor, valves or high pressure elements eliminated. A compound engine running under the most favorable conditions into a condenser does not exhaust at less than 5 pounds absolute pressure or 20 inches of vacuum. The turbine on the other hand is capable of utilizing very nearly the complete range of expansion and, therefore, develops that much additional power. It is specially designed to handle the larger volume of steam after partial expansion in the engine cylinders, and to expand it through the lower pressures until the vacuum of the condenser is reached. In general, the steam economy of a simple engine and an exhaust steam turbine operating together is always an improvement over that obtained by compounding a simple engine. The plant capacity is increased from 50% to 100% by exhausting through an exhaust turbine to a condenser on a non-condensing engine.

When more power is required the plant owner has four alternatives for securing it. First, he may install a larger or additional engine, requiring additional boiler capacity, perhaps involving enlarging the buildings, and increasing labor and upkeep costs materially. Second, more power may be secured by running the old engines condensing; but no engine, either simple or compound, operating at the most economical point of cut off and otherwise under the best conditions, can deliver over 20% to 25% more power than when running non-condensing. The third method is to change the engines to run condensing and utilize the additional range of pressure drop to drive an exhaust steam turbine, making it possible to almost double the amount of power previously secured, without increasing the duty on the engines and without using any more steam. The initial cost is less per horse power than for additional boiler and engine capacity. The turbine and condenser fit into a very small space and can be cut into the exhaust line without interfering with the engine and usually without altering the layout of the plant. The turbine hardly affects plant operating costs, as it seldom requires other attention than occasional lubrication and re-packing of stuffing boxes. The fourth alternative is that of utilizing the exhaust steam for gas making, thus cutting down the load on the boilers about 25 to 35%, and if additional engine equipment is necessary installing high pressure apparatus. Very often no additional engine equipment is necessary and it is merely a matter of using the steam more economically, or else installing additional boilers. Where additional boiler capacity alone is needed there is no doubt but what an exhaust steam system for gas making is the proper installation. In any proposed low pressure turbine installation all the various items must be taken into consideration, such as the cost of installation, local conditions, cost of boiler fuel, exhaust steam available, etc. If all conditions warrant the installation, the turbine should prove to be a distinct asset to any gas or electric plant and will be the means of a considerable saving in fuel.

Exhaust Steam for Gas Making.—Probably the most economical and certainly the most interesting application of exhaust steam is its use in making water gas. The substitution of exhaust for live steam in gas generators has been talked about for years, but only lately has it met with success worth mentioning. In all the early experiments, wet exhaust steam direct from the engines was used and the entrained moisture caused no end of trouble. Various methods of removing the free water were tried, including tapping systems and separators of all styles. Although most of the free water was removed this way, the water in suspension remained. The bottom of a generator is a poor heat retainer at its best, and with a fire partly clinkered exerts a decided chilling effect on steam admitted to it. So, if the entering steam is wet to start with, and is then still further chilled, a large portion of it will condense and stay in the generator instead of going through the fire. This water keeps accumulating and helps to condense more steam, and the generator bottom is continually wet and soggy. This naturally causes a loss in efficiency in the machine. On down runs this cooling effect is carried by the gas to the carburetor; the checkerbrick is cooled; the fire is in poor condition and the whole machine sustains a loss in heat that could be avoided if dry steam were used. This heat must be replaced during the time of blasting, and consequently longer blows are required, which means increased fuel consumption. The exact amount of loss in efficiency due to wet steam will be shown later, and very little economy can be gained by using wet exhaust in place of live steam. The make per square foot is reduced, the fixed carbon per M. is increased, and there is a slight saving in boiler fuel, but not enough to overcome the loss in the generators. However, the idea of utilizing exhaust in this way was not abandoned. The cause of the failure was evident from the condition of the machines after a short run on exhaust steam, and it was decided to try getting rid of the water in the steam, or in other words raising the temperature of the exhaust well above the saturation point. A superheater of suitable dimensions was installed capable of superheating the steam several hundred degrees F. The superheater was fired by hand and the fuel used was mostly refuse coke from the generators. The results showed very marked improvement, not only in boiler fuel, but the machines made more gas and of a better quality than with live steam. A slight saving was also noticed in generator fuel, due to the increased make per square foot. In the first experiments the temperature was raised to about 300° F., or approximately the same as that of live steam. It was later increased to about 450° F., which seems to give the most uniform results. Not much improvement can be noticed by carrying it higher.

These experiments were made in a small plant near Chicago. Two small machines were equipped, and the piping, etc., was made as simple as possible. After getting such encouraging results, one of the large plants in the city, with six 12-foot Williamson machines, was completely equipped for exhaust steam. There are four large exhausters for pumping gas for street pressure, two works enhaustors, individual turbo-blowers on each machine, besides pumps and smaller miscellaneous engines. In 1913 two more plants were fully equipped for exhaust steam, one having Williamson machines, the other ten 3-shell machines. In all of these installations the saving was immediate and marked. The drop in steam consumption for

the plant was decided in every case. Where it took approximately 1,200 boiler horse power for a make of 12,000,000 feet of gas per day, using live steam, it now requires only 900 horse power. Exhaustive tests have been made at all of these plants to determine just what economy is obtained. The item that shows the saving directly due to exhaust steam is the pounds of steam used per 1,000 feet of gas made, which includes all the steam used in the plant. According to the latest data at hand this steam consumption was reduced from 100 pounds to approximately 70 pounds per 1,000, a saving of about 30%, which, with an average make of 10,000,000 feet per day, would amount to $25 or $30 per day, not allowing for depreciation on the installation or the cost of superheating the exhaust, which will be discussed later.

The final efficiency will figure out much higher than if the steam were utilized in a low pressure steam turbine.

Assuming a plant in which 800-boiler horse power is generated, there will be 24,000 pounds of steam, which after being used in the engines, pumps, etc., escapes as exhaust. Deducting 10% for moisture after the steam leaves the engines and 15% for feed water heating, would leave 18,000 pounds available for use. If this plant is making 500,000 feet of gas per hour, the steam required per M. being about 28 pounds, 14,000 pounds of the available exhaust steam would be used while only 4,000 pounds would escape to the atmosphere. In this case the thermal efficiency would be 77%, almost equal to that of a feed water heater. In actual practice, however, it would hardly be that high on account of the irregularity of the blasting and running time of the machines. If, with four generators running, two could always be on blast and the other two on run, the efficiency might be maintained, but this is almost impossible and consequently at one time there may be a big volume of steam wasted to the atmosphere while a few minutes later the steam may be insufficient and live steam may have to be admitted to the exhaust system to bridge over.

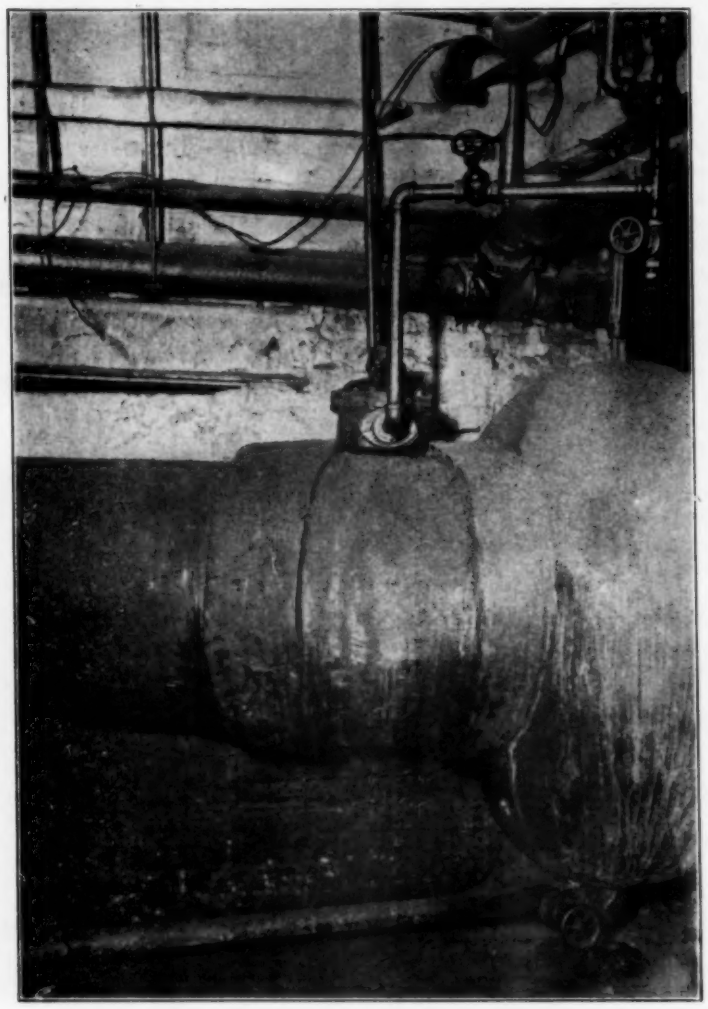

Fig. 2.—Oil and Water Separator on Inlet to Superheater.

A layout of an installation for utilizing exhaust steam for gas making is shown in Fig. 1. All of the exhaust steam from the engines, turbines, pumps, etc., is gathered into a common header that leads to the inlet of the superheater, the size of the inlet in this case being 20″. At two points, preferably some distance from the superheater, 18″ back pressure asmospheric valves are installed with exhaust heads leading to the air. They are kept away from the superheater to avoid unnecessary fluctuations in pressure near superheater, because the auxiliary live steam admission valve is very sensitive to any sudden changes in pressure. The back pressure valves are usually set at about 3½ pounds. The reason for having two of them is in case one fails to work or is out of commission for repairs the other can keep the pressure from building up on the engines. Another valve, similar to a pop-valve, is installed on the inlet drum of the superheater, which blows at a pressure slightly higher than the back pressure valves. This valve is merely a precaution required of the City Boiler Inspection Department. At all the low points in the system traps should be installed to take care of the free water, and they should be regularly inspected and blown out so that they work at all times. Near the inlet of the superheater a good sized oil and water separator should be placed to take out the oil and whatever water is left in the steam.

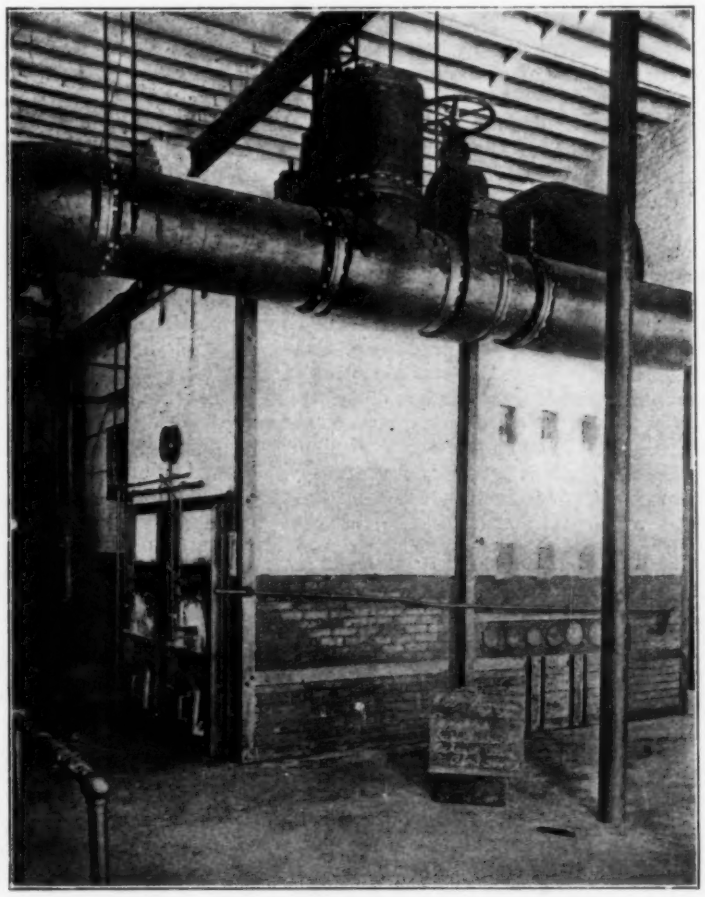

Fig. 3.—View of Superheater.

Fig. 3 is a view of the superheater at this installation. It is of the Foster type, capable of superheating 33,000 pounds of steam per hour to a temperature of 477° F., at 5 pounds maximum pressure. They are made of any desired capacity and with the grates for solid fuel or with tar burners. The latter type of firing seems to be the most economical. A tar burner with a steam jet is a simple affair and requires very little attention. Occasional adjustment of the tar and steam valves is all that is necessary and this can easily be added to the duties of the boiler fireman. Drip oil has been tried in this type of burner and is more efficient than tar. It is almost impossible to make smoke with drip oil and its heating value is considerably higher than tar. The quantity necessary is about .04 gallon per 1,000 feet of gas. The superheater is composed of horizontal headers with vertical elements connecting them. The steam enters at the bottom and leaves on the opposite side at the top.

In the outlet pipe from the superheater is a recording thermometer reading to 700° F., which makes a record of the temperature of the steam leaving the superheater, and the fireman governs his firing accordingly. Under good running conditions the tar or oil burner should not need adjusting more than three or four times an hour. With proper care in firing no repairs should be necessary on the superheater for years, other than the occasional renewing of

the checkerbrick in the fire box. A steam flue blower with a rubber hose attachment for blowing the dust from the tubes is used for cleaning. The outlet pipe from the superheater is the same size as the inlet, 20″, and extends to the generator house basement, and should have at least one expansion joint. The 8″ branches leading to the 12′ gas generators are taken from this 20″ header and have quick opening gate valves operated hydraulically for both up and down runs.

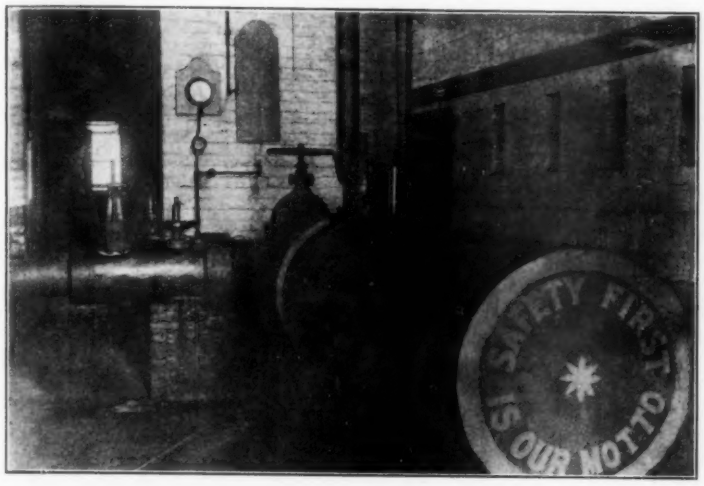

Fig. 4.—Inlet to Superheater and Auxiliary Live Steam Admission Valve.

All the piping from the outlet of the superheater to the shell of the machine should be well covered with good double thick magnesia pipe covering to insure minimum drop in the temperature of the steam after it leaves the superheater. Likewise all of the exhaust piping from the various parts of the plant to the superheater should be properly lagged. At the end of the header leading into the generator house, and at intermediate points, pipes should be placed to drain off condensation that may form while the system is shut down or while it is being put into operation. After the piping is heated up not a drop will be found at the drains.

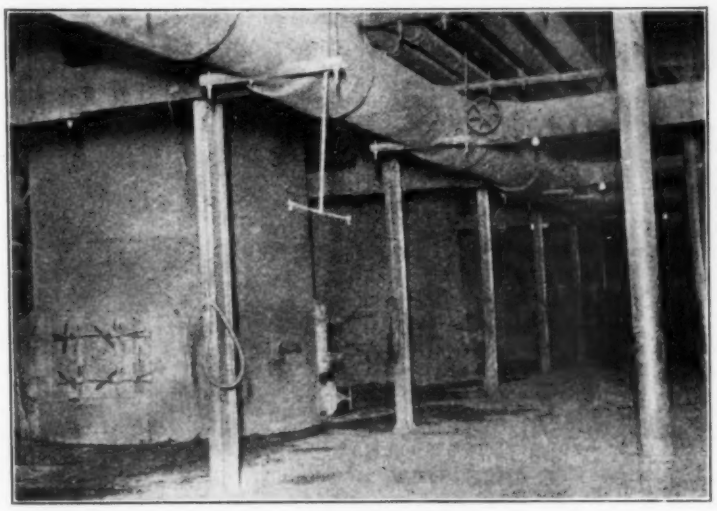

Fig. 5.—Exhaust Steam Header in Generator House Basement.

The pressure in the bottom of a gas generator probably never exceeds 54 inches of water pressure during a run. If the pressure in the exhaust system drops below two pounds, some provision should be made whereby the pressure can be boosted temporarily until the excessive drain is taken off the system. This can be by installing a regenerator similar to the one described under low pressure turbines; but on account of the volume of steam used, it would have to be so large as to make its use almost prohibitive. The emergency can be met economically by an auxiliary live steam valve on the exhaust inlet pipe to the superheater. This valve reduces the steam from boiler pressure to two pounds gauge pressure, and must be very sensitive and reliable under all conditions. It should be wide open at 2 pounds pressure and shut at 2½ pounds. It should be large enough to meet the maximum demand for load and should never let the pressure in the exhaust system drop below 2 pounds. Considerable difficulty was at first encountered in finding a valve to fill these requirements, but we found one that does the work to perfection. Sometimes the running of the machines is such that it opens quite frequently, while at other times it may be shut tight for hours at a time.

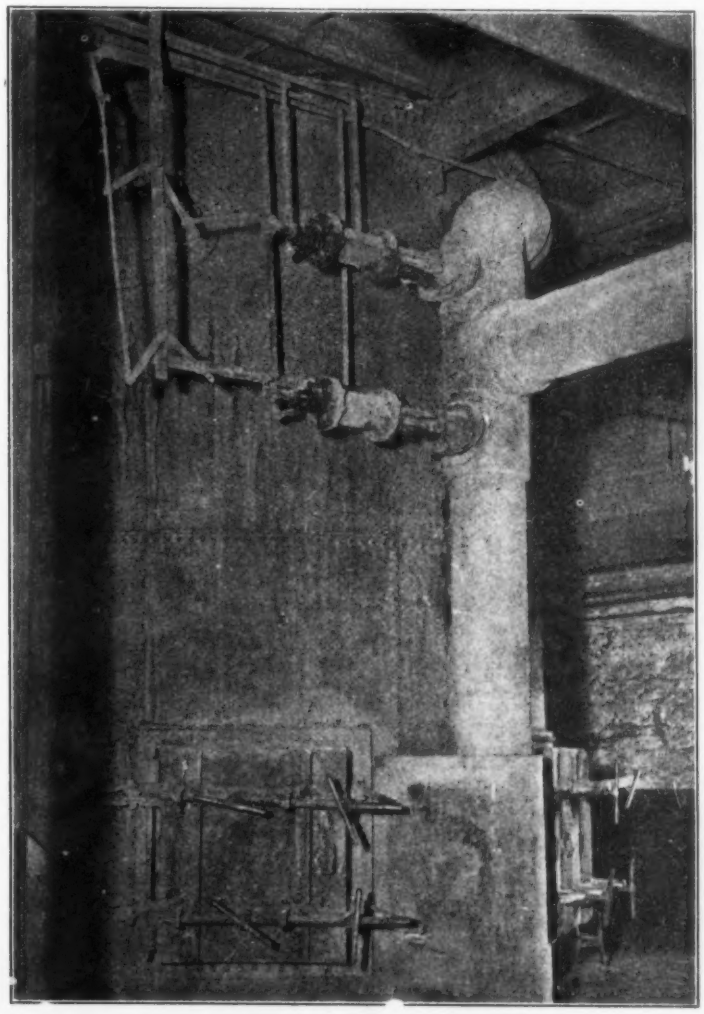

Fig. 6.—Up and Down Run Exhaust Steam Inlets to Generator with Quick Opening Hydraulic Valves.

It is well known that there are times in even the best regulated plants when it is next to impossible for the fireman to keep his boilers from blowing off. Often he throws open the furnace doors, allowing an excess of air to go through the boiler and thus check the rise in pressure, not realizing the consequent loss in efficiency. It would be a very simple matter to allow this excess steam to blow into the exhaust system and utilize it instead of blowing it into the atmosphere. A spring loaded valve could be installed connecting the boiler header with the exhaust line, set to blow at say two or three pounds below the safety valves and an automatic alarm attached to it to draw the fireman's attention to the fact that it was blowing. The chances are that the steam would be needed in the exhaust system just at that time, for high boiler pressure is almost always accompanied by low pressure in the exhaust system.

The measurement of the amount of exhaust going into the generators has been a difficult problem because of the low pressure of the steam. The common methods of measuring live steam cannot be used for exhaust. When three or four machines are running the fluctuation in pressure is so great that any method based on a constant inlet pressure is almost useless. Pressure gauges on the top and bottom of the generator, although useful in a way, do not give us any idea of the quantity of steam going through the machine. The pressure in the machine depends on the number of machines on a run, because the more gas that is being made the greater is the back pressure all through the machine. The only pressure that does remain uniform under these conditions is the differential between the seal or cross pipe and the generator. This differential is not entirely reliable either, because it rises when the oil is on. However, this is a very simple method and is being used to good advantage, the gasmaker being instructed to keep a constant pressure while his oil is on and to disregard it when the oil is shut off. An objection that might be made to running by the

differential pressure is that when the checkerbrick has been in the machine a long time the loss in pressure through the machine is greater and less steam passes through it for the same differential. This is as it should be, however, because if the checkerbrick is carboned the machine is not in condition to make as much gas and consequently should take less steam.

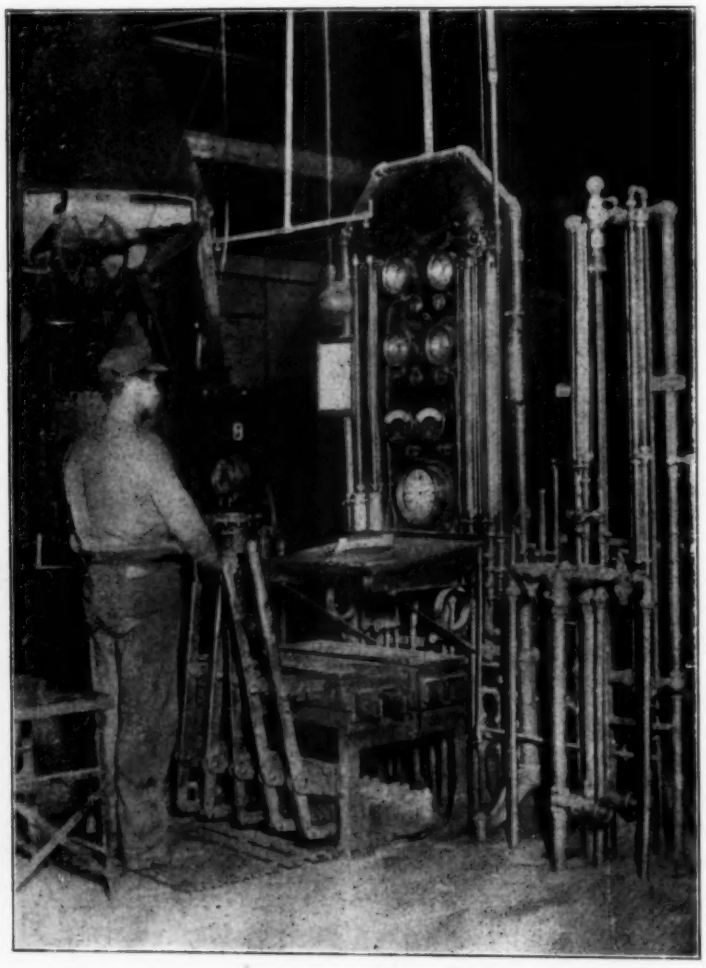

Fig. 7.—Gauge Board and Hydraulic Valves.

The pitot tube principle is probably the most reliable for measuring exhaust steam.

In all of the low pressure steam installations for gas making comprehensive tests have been made to determine the improvement in operating results that could be credited to the use of exhaust steam. The limited space of this paper will not permit the tabulating of all the tests, but a few have been selected.

Table No. 1 gives comparative results of tests with live steam, saturated exhaust and superheated exhaust.

TABLE 1.

	Live Steam.	Saturated Exhaust.	Superheated Exhaust.
Gas made per sq. ft. of grate surface, cu. ft.	38,300	35,850	50,100
Pounds of carbon per M. cu. ft. of gas.	26.69	27.49	26.04
Boiler fuel per M. including superheater fuel	25.46	23.90	20.62

Table No. 2 shows results on four 12-foot machines using live steam and superheated exhaust.

TABLE 2.

	Live Steam.	Superheated Exhaust.
Gas made per sq. ft. of grate surface, cu. ft.	38,150	47,403
Pounds of carbon per M. cu. ft.	28.02	27.06
Total water used in boilers, pounds per M	130.5	86.4
Boiler coal per M. including superheater fuel	21.05	13.88

Table No. 3 gives results of a test made in December, 1914, on four 12-foot machines.

TABLE 3.

	Live Steam.	Superheated Exhaust.
Total gas made per 24 hours on 4 12-foot machines	10,954 M.	11,807 M.
Pounds of carbon per M. cubic feet of gas	28.37	27.09
Boiler fuel per M. including superheater fuel	13.56	9.67
Total water used in boilers, pounds per M.	97.5	70.0

These tests show the steam used per 1,000 cubic feet of gas made reduced between 25% and 35%, or approximately the whole of the live steam necessary for gas making is saved. In every case one and in some cases two less boilers are needed for the same number of machines. The saving in wear and tear on the boilers can also be credited to exhaust steam. The boiler room labor needed is less, as 25% less coal is used. In every case the quantity of gas made increased considerably, due to the better quality of steam. The exhaust steam being absolutely dry reaches the generator in most efficient form, and its cooling effect on the generator and the fire is reduced to a minimum. The pyromoter temperatures drop less and consequently the blasting time can be reduced, which means increased running time and larger make. On account of the shorter blasting time, the generator fuel is reduced per 1,000 and likewise the amount of air blast necessary. The machine as a whole seems to be in better condition when operated with superheated exhaust, and naturally the results obtained are better.

There are several plants in the East using saturated exhaust with some increase in generator fuel and a considerable reduction in boiler fuel. The question of installing a superheater depends largely on the difference in cost between boiler fuel and generator fuel. Where generator fuel costs three to four times as much as boiler fuel, the investment pays, and even where the two fuels are more nearly alike in price it seems advisable to install a superheater because of the increased efficiency obtained.

For a contemplated installation for utilizing exhaust steam, the first and most important item to be considered is the amount of exhaust available. This brings up the question as to how small a plant can economically use exhaust steam for gas making. It is unfortunate that there is no small isolated plant where exhaust has been tried for gas making. It is true that the plant where these original experiments were made is a small one, but plenty of exhaust is available on account of two high pressure exhausters there. For any proposed installation a very complete study should be made of all the conditions, and most important of all a close approximation made of the maximum and minimum exhaust steam available. Allowance having been made for feed water heating, and free water in the exhaust, the next question arising: Is all the plant machinery in condition to withstand 3 to 4 pounds back pressure, and still run to the desired capacity? Does the plant operate continuously or only part of the time? The number of machines running should be a least two, and it would hardly pay to install a superheater in a plant that does not make gas 24 hours a day, because it takes at least several hours to start up a cold superheater and get steam circulating properly. Likewise when wet exhaust is used there would be considerable trouble in starting up the generators on account of excessive condensation in the lines.

Assuming a plant with at least two machines operating continuously, no matter how small the machines, it may be taken for granted that the exhaust steam can be utilized to advantage for gas making. There are many combination gas and electric plants where the exhaust available far exceeds requirements. There are plants in which all the boiler capacity is necessary for peak load operation, and it is these especially that a superheated exhaust steam system would prove advantageous. A superheater and piping could be installed for half the cost of additional boilers. The steam consumption could be reduced about 30% and the installation of additional boiler equipments postponed for years. The boiler fuel per 1,000 feet of gas made could be reduced from 3 to 5 pounds, and this item alone would pay the interest on the investment and depreciation several times over.

In conclusion it might be said that the use of exhaust steam in low pressure turbines and for gas making is still in its infancy, this phase of the gas business having been developing for a comparatively short time and confined to the larger plants. It can safely be asserted, however, that in the next few years the field for the use of exhaust steam will widen, and even greater developments can be expected than during the last few years.

Confidence and Men.

[Address of MR. JOHN GRIBBEL at the Banquet of the Illinois Gas Association.]

I know you gentlemen. I know some of you better than you know yourselves, and having that knowledge, I wish to heartily congratulate the State of Illinois and the surrounding country that with the ability that I know exists among you, you are not confidence men. I have taken your word for many things. I never think of inquiring why I take it. Some of you have asked me to lend you money and I have always been dead broke when you asked me, and you see by this, of course, mutual confidence has been preserved. But for your encouragement let me quote you that old saying, "while there is life there is hope." If I were in the insurance business, as I look at you, I confess I would have more confidence myself in giving you that information. But let me say to you to-night and from the bottom of my heart, that I have enjoyed my stay among you with an enjoyment that can't be put into words. You see I have come out of the East, and down where I live the laundries are using compressed air instead of indigo, and if I had known the fountain of confidence that I was going to strike here, I would have arrived a week ahead of time and sat upon the doorstep waiting for the doors to open. I think it would be a healthy tonic to the whole gas business for a year, if every gas convention held in the United States might import its speakers from the gentlemen who are here to-night. I haven't seen anything but confidence since I have been sitting here. I was very much pleased at the toastmaster's reference to the Western Gas Association. It is 35 years now since in this wonderful city of Chicago I first looked into the faces of the men who constituted the Western Gas Association. They were giants in their day (leaving myself out of it) and as I consider this audience to-night and look back at the first audience of the Western Gas Association that I saw, I am impressed more deeply than I have ever been with the growth of this business of ours; that to-night this magnificent State of Illinois should marshall such a host as this under the name of the Illinois State Association, as large as the whole Western Gas Association membership was in those days. I look back with a very great deal of pleasure at my contact with the members of the Western Gas Association. They were strong, sturdy, competent, able men, and the most outstanding trait among them was their wholesome comradery, and their devotion to the business they had in hand, and the confidence that was manifested among them. Let me say to you as a matter of fact, that I think one of the most worthy monuments that has ever been erected to the memory of a body of men is to be seen in the co-operation that exists in the American Gas Institute and kindred associations, for this co-operation and this spirit of help that did not come out of the East, it came out of the West. The co-operation that I see here manifested in the Illinois Association marks you gentlemen as worthy sons of very worthy gas scions. I think one of the very great factors of success in the gas business of this last 20 years has been this co-operation which was born in the Western Gas Association, and long may it live in other gas associations. In the times in which we live, a period of flux and change, when we are tempted at times to believe the whole world is in a state of flux, when on every hand we hear an incessant cry for change, change, it is refreshing to get into an atmosphere like this where sanity and wisdom are the handmaidens of progress. I warn you that in considering these apostles of uplift, in listening to their message, that you very seriously consider this matter of change. Down in the quiet town in which I have the privilege of living (Mr. Forstall lives there too, so don't blame me), in one of our city schools last Christmas time a teacher gathered a half dozen youngsters from the street into a little class, among them two Hebrew lads. She gave to each of the class a half dollar that they might have some Christmas cheer, even the Hebrew lads. When they came together again after the New Year, she asked one of the Hebrews what he did with his half dollar, and he said he bought a present for his mother that cost 20 cents, and for two sisters 10 cents each, so he had 10 cents left and he kept that for himself. She patted him on the head and thought he was very promising. Then she asked the other lad what he did with his half dollar. Now listen to this story because you may have to deal with this lad out here in Chicago some day. He said he changed his half dollar into two quarters. Well, said she, "What did you do with the two quarters?" He said, "I changed the two quarters into four dimes and two nickels." She said, "Yes, but what did you do with the money?" He said, "Well, I changed the four dimes into eight nickels and then I had ten nickels." "Yes, but what did you do with the money?" He said, "I changed the ten nickels into pennies and I have got them yet." "But why did you go to all that trouble if you were going to keep the money?" He said, "Well, somebody might make a mistake in making change. Now, gentlemen, I warn you that all change is not profitable, but I beg of you do not become pessimistic, for remember a pessimist is a destructive critic gone to seed. He isn't worth as much as a thistle. Then I warn you also to not become negative, for that is only 1° removed from pessimism. Don't any of you get into the state of mind of that young Scotchman at Harvard. His name was Lynn. I don't know whether that was any relation or not, but we will let the story determine. One night some of his classmates said to him, "Lynn, if you took your best girl to the Touraine to dinner, and then got a box for her at the opera, and then took her home in a limousine, wouldn't you think you were entitled to give her a kiss when you bid her goodnight?" He thought it over for three consecutive minutes, and said, "Well, I don't know. I would think I had given her enough already." I suggest that you let the story determine the relationship. Now, gentlemen, don't become pessimistic and don't become negative in this business of ours. Remember you are not half as bad off as the railroad men of the country. When you are tempted to be pessimistic remember Murphy, the quarry man. Murphy had gone up to the wages' wagon and gotten his envelope, and on returning to his particular post in the quarry he was hailed by Finnegan, to give him a hand. Well, the blast went off prematurely and blew off Murphy's left hand, and they came about him bewailing the fate and misfortune; but he said, "It might have worse." They said; "Sure, man, it could not have been any worse?" "Oh, sure it could. It might have blown off the right hand that I had my envelope in."

Over the desk of every gas man to-day should be written that wholesome motto: "Come, let us reason together." I beg of you never take that motto down, for in our business we cannot win under any other slogan. Mistakes have been made by your legislators and public service commissions, by the people themselves in the public forum; and here behind these closed doors, with no reporters present, let us confess to each other that we may have made minor mistakes in our sparkling devotions to the interests committed to our charge. But let us also remember that a mistake is not a crime. A mistake may be a blessing if it leads to wisdom in its correction. It is the blunder that is a crime, and I beg of you that in the readjustment of the new conditions that we are facing, we do not commit blunders. Don't do like the farmer who bought a new reaping machine, and the first day he took it out to use it fell off the seat, and his nose went down between the knives and they cut his nose off. Being a very vigorous man, he picked the nose up, put it on, and went back to his work, nursing his nose himself. But behold, he had put it on upside down, and when it rained the water would run into his nose, and when he sneezed he blew his hat off. The world has never seen such a group of blunders as have been produced this last eight or ten months; and if it hadn't been for the world's crop we to-night might have been considering our own industry in the same direction. Blunders destroy confidence. That is the reason a blunder is a crime. I plead with you that you devote your highest thought and your greatest energy, with your longest patience and your most incessant activity to this task, that you don't commit blunders in making your adjustments. We still hear the saying on every hand "that corporations have no souls," but I call you to witness that you don't hear it quite as often as you used to. Aristotle or Plato never said a truer thing than did our own Emerson when he said that "Every organization is but the lengthened shadow of a man." Every corporation represented at this bountiful board bears in its community the features of the composite man that the public sees in its dealings with that corporation. You and I, each up to the opportunity of the day's work and according to our ability, control and determine the features of the composite individual that our public sees in the corporation for which we labor; and that individual controls the impressions that our corporation makes up the public, and it is upon these impressions that this indispensable, intangible, indefinite thing is built that we call confidence. Some day when you and I and our successors who have worked out this problem to the last analysis and have established this thing we call confidence, the youngest of you and those who are going to follow us and who are older, will stand in the same light in the community that was evidenced in Little Jimmie at our Philadelphia Almshouse the other day. Jimmie was taken to the public hospital with a developed case of smallgox of the malignant kind, and the nurse thought that it was going to be a fatal case. When she thought Jimmie was

(*Continued on page 234.*)

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SANFORD K. CAMPBELL, Editor.

NEW YORK, MONDAY, APRIL 12, 1915.

To Get All Sides.

In probably the majority of cases, the real value of the papers presented at association meetings is in the discussion they provoke. If anything really new is put forth it will bring out questions and detailed examination. For this reason the JOURNAL publishes what it can of the more important "discussions" and hopes that its readers will give them attention. It has been said that the way to clarify your ideas on any subject is to write a paper upon it; very often, also, the discussion of a paper may considerably alter the author's ideas. Our preconceived notions very seldom are uneffected by hearing all sides of a question, even if at the moment we are not willing to admit it publicly.

Attracting Young Men to the Industry.

A correspondent of a London contemporary calls attention to the relative value of brains and brawn as indicated by the advertisements for help wanted. The positions vacant and the pay offered were:

	Per week.
Junior chemist, used to routine tests	30s. 0d.
Clerical assistant, two or three years' experience	15s. 4½d.
Clerk, thorough knowledge of typewriting, shorthand and bookkeeping	21s. 0d.
Clerk of gas works office	20s. 0d.
Stoker, regular employment, week holiday	34s. 0d.
" leading, week holiday	31s. 0d. and bonus.
" regular employment, 5s. 6d. shift, equal, at 6½ shifts a week, to	35s. 9d.

"From these it appears that a stoker is worth twice as much as a clerical assistant with 3 years experience. A thorough knowledge of typewriting, shorthand and bookkeeping is assessed at less than two-thirds the value of a stoker, and a knowledge of 'routine tests' at some shillings a week less. Also, notice that although the clerical workers are in positions of responsibility and trust, the terms offered are, at present prices of necessities, not equal to a bare living wage. Lads thinking of entering a gas office as junior, with the hope of working their way up, will do well to consider these facts."

The same conditions obtain with us on this side of the Atlantic, and the men digging ditches are in many cases paid more than our young clerks. By training and educating your men you do not help yourself if you refuse to pay them what they are worth. This is the olden time objection to all education and progress, "educating the masses above their position."

German Dyes and Foreign Industries.

The weekly bulletin of the American Association of Commerce and Trade (Berlin) comments on the importance of dye imports, and says that America, England and France depend in differing measure upon the import of German dyestuffs, and the interruption of the supply has had a far reaching effect on their textile industries.

It will be of interest to know the opinion of the formost American manufacturer and importer of dyestuffs, Mr. Herman A. Metz of New York, voiced at a recent meeting of a commercial body in Boston.

Mr. Metz said: "We know that our manufacturers are dependent upon other countries. In chemicals we depend upon Germany, and I realized very soon after the war was declared that we would have trouble getting goods in. It did not affect the dyestuff people so much, they could shut down for a while and not starve, but the ramifications of the textile industry, the mills and the people working in them would be affected. Then the cry went up, 'Manufacture those things here.' That sounds good, but Germany is a step in advance of all other nations in the chemical industry; not reached over night. It has taken her 50 years to get there. She has done it by combinations and trusts possible under her laws: combinations that would put us in jail over here. Conditions vary in different countries, and they have succeeded in building up an industry that is a one-country industry. You know that you can do better in one unit than in 20. Your overhead is less and you get better results. The Germans do in one or two plants more than is done in all the rest of the world, in the way of manufacuring fine colors."

Mr. Metz discounted the alleged gain that would come through revision of American patent laws, saying, "that as a matter of fact not over 5 per cent of the dyestuffs used to-day are patented, and of those at least 3 per cent. will expire in the next two years. The majority of the colors have been free anywhere from 15 to 20 years. They have been made in America to some extent, from imported intermediate products. The Belgians, who produced probably the finest raw materials for color in the world at their coke ovens in Liege, do not make colors, but buy them from Germany. Their products are sent to Germany and worked up there.

"Patent laws do not make any difference. One suggestion is to have a clause providing for compulsory operation. In other words, if you get a patent, you must carry it out in America within 2 or 3 years. That sounds good in theory, and some countries have such a working clause, but not one of them has a chemical industry. England, a few years ago, passed a working clause on dyestuffs and chemicals, with the result they have a number of small plants in England, where they make some things, as we have done here. Colors were duty free and the Germans went to England and put up two plants, brought raw materials from Germany, carried out the process to meet the law, and fixed the price so that the English consumer paid for the amortizement of the plant and the life of the patent.

"When the war came, England confiscated the patents, had the plants, and kept some of the men in them. But they are now shut down and England is trying to get dyestuffs from America.

"If we did change our patent laws and compelled working in America, it would affect only new inventions, and they are not going to be as plentiful in the next 50 years as they have been in the last 50, because the industry has been well cleaned up. Besides we cannot make the dyes without a high protective tariff, and we have had a tariff of not less than 30% for the last 50 years. If we start the industry in America we will have to build up from the bottom, unless we have a tariff so high that it would cover the erection of plants and so forth. Bear in mind that the German plants are amortized long ago. The difference in the laws is that they have a process patent that protects the products made by the process. We in America have a product patent, that no matter how else you may make the dye, the original product is protected. We want relief now, we want the products now, not 5 years from now."

The only solution of the present situation, according to Mr. Metz, is to continue to draw supplies from Germany. A different view is

taken by Mr. Thomas A. Edison, who has erected a benzole recovery plant of his own design and gone into the dye making business. Mr. Edison is quoted as saying the United States would soon be manufacturing its own dyes, and that the famine in dyes, due to the war, was about to end. At his plant at Silver Lake, N. J. he had already made large quantities of anlline dyes, and that it was only necessary for textile manufacturers to follow his example to break the monopoly which Germany has had in the dye industry.

Since the outbreak of the war he has been making carbolic acid, aniline oil and benzol. The last sold at 25 cents a gallon before the war; to-day it is sixty to seventy-five cents. Aniline oil was selling at eleven to twelve cents a pound, now it is up to seventy cents. He is not making very much money in this line, but thought he would make the start, hoping some of these timid Americans who lack backbone to father a movement will now follow suit.

The Germans controlled the trade to such a degree that no one else gave much tbought to it. But the textile men in this country need not be worried. We can make for them all the colors they wish, and more. What we need most is a protective law such as Canada has. We should prevent "dumping" here of foreign goods.

PENNSYLVANIA GAS ASSOCIATION PROGRAMME, HOTEL ADELPHIA, PHILADELPHIA, APRIL 14, 15 AND 16.

Wednesday, 10:00 A.M., April 14.—Opening Session.

Address of Welcome, by Hon. George Porter, Director of Public Safety, Philadelphia.
Reading of Minutes of Last Meeting.
Report of Membership Committee; Mr. F. P. Duggan.
Report of Council on New Members.
Election and Introduction of New Members.
Report of Secretary and Treasurer; Mr. W. O. Lawson.
Report of Finance Committee; Mr. H. H. Ganser.
Report of Public Relations Committee; Mr. J. H. Keppleman.
Report of Uniform System of Accounting Committee.
Report of Architects Booklet Committee; Mr. L. R. Dutton.
Report of Entertainment Committee; Mr. R. J. Rolston.
Report of Programme Committee; Mr. J. E. Philbrick.
Report of Representative on International Gas Congress.
Luncheon and Inspection of Manufacturers' Display.

2:00 P.M.

Joint Meeting with New Jersey State Gas Association.
President's Address—Mr. L. R. Dutton, Pennsylvania Gas Association; Mr. C. H. Butcher, New Jersey State Gas Association.
Paper by Mr. R. F. Pierce—"Residence Lighting."
Paper by Mr. H. Thurston Owens—"Benefit of Welfare and Educational Work among Gas Company Employees."

6:30 P.M.

Banquet and Dance for Members and Ladies, Pennsylvania Gas Association, New Jersey State Gas Association, Officers and Directors American Gas Institute and National Commercial Gas Association, at Hotel Adelphia: under auspices of the Philadelphia Gas Meeters.

Thursday, April 15, 10:00 A.M.

Paper by Mr. C. E. Bartlett—"Water Heating by Gas."
Paper by Mr. J. H. Gaylord—"Domestic Uses of Gas."
Discussion, "What is a Profitable Gas Main Extention?" by Mr. H. H. Ganser.
Directors of American Gas Institute to Meet, Room A.
Luncheon, and Inspection Manufacturers' Display.

2:00 P.M.

Ladies accompany members on auto ride through suburbs of Philadelphia and part of the district supplied by the Philadelphia Suburban Gas and Electric Company, ending at the Old York Road Country Club, Jenkintown, Pa.

3:30 P.M.

Baseball Game or Golf. (Members desiring to play golf can make arrangements at the club grounds.)
Ladies return from auto ride to dinner at Adelphia Hotel and Theatre Party at 8 P.M.

6:30 P.M.

Men's Supper at the Old York Road Country Club, Jenkintown, Pa.
Debate—"Resolved, That a New Business Department is an Economy, not an Expense."
Report of Nominating Committee.
Report of Next Place of Meeting.
Election of Officers.

Friday, April 16, 10:00 A.M.

Paper by Mr. R. H. Whipple—"Records and Forms for Use in Gas Company Valuation Work."
Demonstration—"Gas Main Welding," Mr. J. D. Shattuck.
Merchandising Methods Employed hy Gas Companies.
Discussion of Short Topics.

[OFFICIAL NOTICES.]

New Jersey State Gas Association.

NEWARK, N. J., April 6, 1915.

At the annual meeting of the New Jersey State Gas Association, at the Adelphia Hotel, Philadelphia, Pa., Wednesday, April 14th, it is proposed to have the morning session commence at 10.30 A.M., at which time the election of officers will take place and such other business as may come before the Association.

The afternoon session will be a joint session with the Pennsylvania Gas Association, at which time the members will have an opportunity of listening to some very fine papers, among which will be a paper for the New Jersey State Gas Association on "Welfare and Educational Work that has been done by Gas Companies," by Mr. H. Thurston Owens, and a cracking good paper may be expected.

If you desire to remain in Philadelphia over night write to Mr. R. J. Rolston, Chairman of the Entertainment Committee, at 1008 Filbert street, Philadelphia.

The Gas Meeters' dinner, on the evening of April 14th, at the Adelphia Hotel, should prove a repetition of the big success that marked the last Gas Meeters' dinner at this hotel.

Set aside April 14th as the day that you will be in Philadelphia. Come to the meeting of the New Jersey State Gas Association with the determination to start in the year 1915–16 with a vim and give the officers and members your hearty support and endorsement.

O. F. POTTER, Secretary.

Iowa District Gas Association.

DES MOINES, IA., March 22, 1915.

The Eleventh Annual Meeting of the Iowa District Gas Association will be held in Clinton, Iowa, May 26, 27, and 28.

The headquarters of the Association will be at the Lafayette Inn. Members are urgently requested to make early reservations. Mr. Thos. Crawford, General Manager, Clinton Gas and Electric Company, is Chairman of the Committee of Arrangements, and will furnish any information desired. Reservations may be made by communicating with the Lafayette Inn.

The following papers will be presented at the meeting:

"How can we Most Profitably Supercede Oil, Coal and Coke with Artificial Gas as Fuel in Industrial Plants?" by E. L. Lambert.
"Industrial Appliances," by W. L. Powers.
"Iceless Refrigeration," by Malcolm F. Ewen.
"Commissions and Financing of Gas Properties," by Andrew Cooke.

A symposium of short papers on:

"How to Spend Money to Make Money in the Gas Business," by H. C. Blackwell, H. B. Maynard, G. W. Clabaugh, G. I. Vincent, E. I. Lambert and W. H. Taylor.

The attention of the members of the Association is called particularly to the list of papers, which embody the most vital subjects before our industry to-day.

In addition, the following Standing Committees will report: Tar, Manufacturing, Distribution, Construction, New Business and Public Relations.

There will be a smoker and Dutch lunch on Wednesday night, a trip to Eagle Point Park, and an open air picnic meeting on Thursday, and a boat trip on the Mississippi river on Friday.

T. B. GENAY, Secretary.

(*Continued from page 231.*)

Confidence and Men.

close to the River, she said, "Jimmie, don't you think I had better send for the priest to come to talk to you?" Jimmie, too weak to open his eyes, just moved his head a little and said, "No, send for a Rabbi." The nurse thought it had gone to his brain. She said to him, "Rabbi? Jimmie, why do you want a Rabbi?" Says Jimmie, "Do you think I want the Father to get the smallpox?"

Not long ago I went to a town where a new gas manager had been promoted from the ranks. I went into a barber shop at the hotel and the barber as usual was very conversational in his inclinations, and I had a very interesting experience. I don't know whether that manager is here to-night, but if he is I hope he is listening. The barber said to me, "Say, Mister, I want to tell you the funniest thing what you ever heard." I said, "Go on. I would like to hear something funny just now." He said, "I went to the gas office here two or three days ago to tell them about the rotten gas I was getting at my house. There was a new man at the window that has the word 'Complaint' painted over him, and after I got through with my kick, what do you think he did? He leaned forward in the window and thanked me for taking the trouble to come in and tell him about it. Why, I nearly fell dead. Then he said, 'Sure we will send up and see about it.' Right away he sent up a man. The gas was all right, it was first class, but the trouble was with the pipes. He fixed it all up, but that isn't the the funny thing that I was going to tell you. This is it. This is the funniest thing that you ever heard. When I got home last night my wife told me there had been a gentleman there from the gas company. He came up to ask if the man that they sent fixed what we wanted fixed. My wife said the President of the company was there, or he must have been a Director anyhow, because he was so polite."

Now, gentlemen, in this complex business that you and I are in, I sometimes wonder how you can all be so light-hearted with what you have on your heads, with the necessity for concentrating attention upon the attenuating problems, and the increased necessity for attention to economy in production and distribution. But I want to beg that you give attention in increasing measure to this human presentation of our business that we are making to our public. We have been making mistakes, some of us, not you wise men, but some of us like myself have been making them, like the miller in New England some years ago. The millpond had frozen over with the first ice. Two venturesome boys skated around and then they ventured, as you and I have done, as near to the center as they could go, and one of them broke through the ice and fell in. The other boy ran back, calling for help, and the miller ran out. He saw the situation at a glance; he rushed to a pile of poles on the bank, took the first one his hand reached and went out on the ice as far as it would carry, and then, wise man that he was, laid down on his face and he pushed the pole ahead of him until the end reached the boy in the water. The boy caught hold of the pole with a grasp of determination and the miller pulled away, but the boy lost his grip and slipped back, and the operation was repeated twice and thrice. Then the boy with about all the breath he had left, called out "Give me the other end of the pole." The miller saw that that end of the pole was coated with ice. He turned the pole around and gave the boy the warm end and he was pulled out. I think it would be wise to consider whether or not we cannot more often give the warm end of the pole to those we are doing business with. I will give more for tact in a commercial department than for talent and scientific knowledge. Douglas Gerald once said, "Talent is something, but tact is everything." The oil, gentlemen, that is needed at our complaint desk is just as vital a factor as the oil in our generators; and the temperatures that we need to watch are not all confined to our retort houses; and the quality of our gas is not measured in the public eye by our photometer; and when we establish this thing that we call confidence, our franchises will be perpetual franchises; and this confidence, gentlemen, is to be determined by the individual that represents the company in its dealings with the public, and that individual will be the lengthened shadow that your corporation, your organization, has become. There is a new spirit abroad in the land. We hear it faintly assert itself at times. I recall that a few years age there was a song I used to hear sung by independent men, and men who desired to be known as independents, and it ran thus:

"So East is east
And West is west
And around is the rolling sea;
And I don't give a damn for any other man
Who doesn't give a damn for me."

But I don't hear that song sung now. Instead, I hear a new song, and this new song is:

"Let me live in a house by the side of the road,
Where the race of men go by;
Men who are good and men who are bad,
Quite the same as you and I.
I would not sit in the scorner's seat,
Nor hurl the cynic's vein;
Let me live in the house by the side of the road,
And be a friend to man."

Gentlemen, you and I in dealing with our particular publics have got to get that strain in our conversation.

Gas Lighting at the Panama-Pacific International Exposition.

By C. B. Babcock.

It is a far cry from the days when William Murdoch walked the the streets of London of a night, with a bag of illuminating gas under his arm, lighting his steps homeward; to the present day when gas for illuminating purposes is generally used. One of the most striking facts is that about 50% of the entire output of gas is still used for lighting, and this in the face of the development of it's various uses for fuel. Over one hundred years have passed, bringing about many changes, not only in process of gas manufacture, but in types of gas appliances, for in no department of the gas industry has there been more signal service performed for the good of all than in the development of gas lighting equipment. Light is a necessity. Without it life becomes bleak and void, and if the gas men of to-day do not take full advantage of this field, those interested in electrical development will do so.

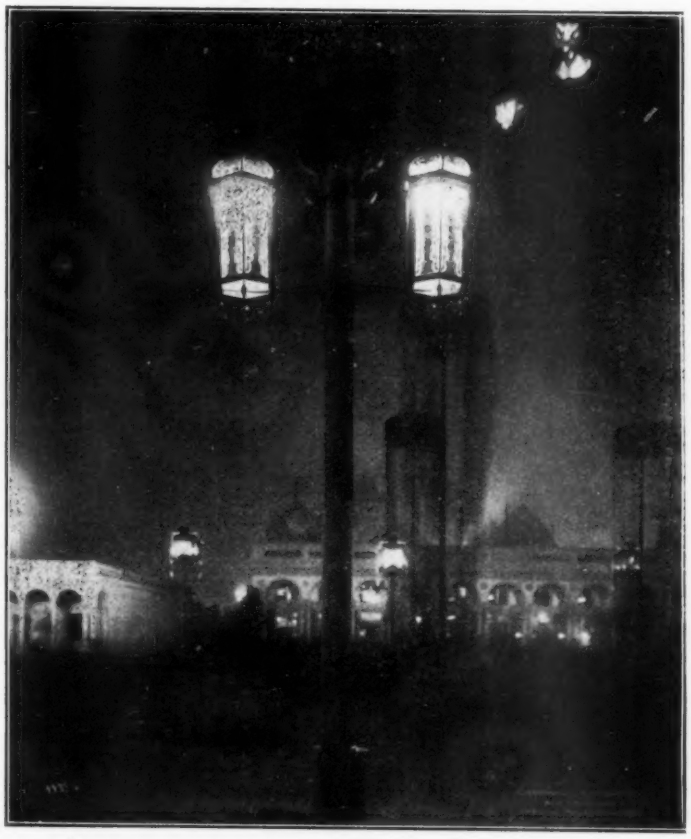
Night View of the Tower of Jewels.

With the opening of the Panama-Pacific International Exposition it has been forcibly conveyed that gas lighting is still considered a necessity, and one has but to observe it's large use there to see this truth in it's entirety. Both high pressure and low pressure gas lamps are used; in fact, gas lamps play a very large part in the great illumination scheme so successfuly carried out by the Mechanical and Electrical Department of the Exposition.

On the "Zone"—the play ground of the Exposition—the adaptability of gas to an ornamentation scheme is vividly shown. There are installed seventy-two posts, seventy-five feet apart, each post 39 feet in height, and surmounted by a conventional sea-lion. Twenty feet from the ground $\frac{3}{4}$-inch pipes run out forming two arms, encased in staff work. From these arms are suspended two 5-mantle low pressure lamps, giving 900 candle power each, the lamps encased in lanterns, a wooden frame work with canvas covering in various designs.

The gas throughout the "Zone" is high pressure, so a regulator

is placed at the base of each post, and also a ¾-inch by-pass cock, which, in connection with the mercury valve distance lighting equipment, makes it possible to turn on and off the lamp at the base of the post. The soft, pleasing rays of light diffused through the vari-colored lanterns give an ornamental and a restful look to this street of amusement.



Posts Carrying Gas Arcs in Ornamental Lanterns.

At all of the exits and entrances of the Exposition Grounds low pressure gas lamps are installed and burn nightly; and at two of the entrances and all of the exits, gas arc lamps are used exclusively.

Throughout the large area comprising the State and Foreign section high pressure lamps are installed, one to a post, burning on 2½ pound pressure, two mantles to the lamp, and giving 1,100 candle power.

One enters the "Court of the Universe" at night, and from out the serpent-headed urns great tongues of flame dart hither and yon, now flickering, now stretching forth in ecstacy, a weird light from out the past, recalling the fires that burned on the altars of ancient Rome. This effect is produced by high pressure gas pouring through ½-inch pipes.

Not only is gas lighting used by the Exposition proper, but practically all of the buildings on the grounds are piped for gas, and modern gas lamps installed: Government buildings, railway company exhibits and concessions on the "Zone."

In the corridors surrounding the Courts of the Exposition buildings gas lamps are used, installed on beautiful staff work brackets; so if the entire electric lighting equipment should be out, the crowds nightly viewing the Fair would experience little discomfort.

For many years it has been the dream of the older men of the gas industry to have a great exhibit of manufactured equipment used in the gas business, and through the efforts of a number of leaders of the gas business and mannfacturers of appliances, this has came about, and the Collective Gas Exhibit, comprising 10,000 square feet of space in the Palace of Manufactures, embodies the realization of their dream. There is much of interest in this Collective Gas Exhibit, but the first thing that attracts the memory of which will long remain, is the beautiful and artistic lighting effect.

In the center of the Exhibit pavilion is a great dome 30 feet high, and suspended from it 20 feet above the floor, is a massive gas fixture equipped with eight 5-mantles, low pressure gas arc lamps, with mercury valve distance control. The candle power from this fixture is approximately 5,600, and the distribution of light is perfect. As this is the largest gas fixture on the Pacific Coast it has made a deep impression on visitors.

The lighting of the 61 booths in the Exhibit, is entirely with semi-indirect fixtures, either in oxidized brass or Roman gold finish, and equipped with the most beautiful types of glassware. There is no glare, and the lighting arrangement helps to make this Exhibit a pleasing place to come, where one may spend profitable and pleasant hours. On the posts in the aisles are large single-mantle and two-mantle lamps at a height of 9 feet. These hang on artistic brackets, and as the lamps are of different colors they give a most pleasing effect, one which relieves monotony and harmonizes well with the general color scheme. The outside of the pavilion is lighted by 5-burner out-door lamps of special design, so that all visitors entering the Palace of Manufactures are bound to be attracted by the pleasing lighting effects.

An Aisle in the Collective Gas Exhibit.

It was necessary shortly after the exhibits were installed to put up signs "Lighted by Gas," as many people were heard to speak of the beautiful electric fixtures.

When the International Gas Congress convenes in San Francisco in September, no matter how far the gas men may have journeyed, the writer is satisfied that they will have no regrets. When the time comes to return to their homes we are certain there will be a tinge of regret at leaving, and too, a renewed ferver and enthusiasm over the great and important field which lies before the gas man in developing his lighting business.

The manufacturers of lighting equipment are wide awake, and alive to the great future of gas lighting, and for many years past have put the best of their brains and capital to making it possible for gas companies to hold their own against electric competition. Surely, with the modern appliances at their command, there is no good reason why gas lighting should not continue to hold a dominant place in the lighting of the world.

It has been deemed fitting by the leaders in the gas industry that this Collective Gas Exhibit be made in San Francisco during the Exposition commemorating the completion of the Panama Canal, the greatest achievement of modern times, in order to show to the world that the gas industry has kept pace with modern progress and development.

Before the close of this great Exposition, December 4th, 1915, every gas man should make an effort to visit it; and when he comes he can be sure of a hearty welcome. "California invites the world to the Panama-Pacific International Exposition."

Concrete Pile Foundation.

[A portion of the Discussion on MR. F. E. DRAKE'S Paper before the New England Association of Gas Engineers.]

The discussion was opened by Mr. Cheney, who saw several points to consider. The paper stated that concrete piles were selected because of durability and relative cost.

One may look on this statement with some doubt. If the most important consideration was durability, considering the underlying 30 feet or more "hard pan," the most durable foundation would be a masonry tank. The wording gives the impression that this was not considered, although a concrete tank could probably be built for the same cost, or possibly a little cheaper than the steel

tank and pile foundation, assuming, of course, proper soil conditions, about which the paper gives no information. The experimental pile dug up and photographed was not driven in conditions at all resembling the actual construction work, although the contractors advertised it in engineering papers as "one of a number driven at Lynn, Mass., for a large gas holder foundation," It was not driven for the foundation and gives no information as to what would have taken place if it had been driven to the same depth as the piles in the foundation.

If we take the average condition of the ground as sand and clay overlaid by about one foot of soft muck, then one foot to one and a half feet of peat, then 10-foot of fill or a total of 12 to 12½ feet of material above the sand, and take the average length of pile given (13 feet 9 inches) we find that the pile penetrated the sand 1′ 3″ to 1′ 9″. Therefore from about 1′ 6″ above the pile point to about 2′ 6″ above it, or about in the middle of the bulb is a layer of soft muck. There is of necessity considerable confusion of terms in describing soil, and it is to be hoped that the author used the term "soft muck" in a sense very different from the common interpretation. If this "soft muck" was semi-fiuid it would be almost certain to flow into the hole when the steel core was withdrawn for the purpose of putting in the first charge of concrete. If this happened, the concrete of the bulb would be worthless and the pile undependable. I do not mean that every pile would fail, but to be even reasonably sure that the piles would sustain the load it would be necessary to test nearly all of them.

Suppose, however, which I hope was the case, that the muck was sufficiently stiff to retain its place when the core was withdrawn, it would still furnish a path of least resistence for the concrete to flow away from the ram, since there was a layer of stiffer material both above and below, and the resulting bulb would probably not resemble the diagrams. We might expect to find the base a bulb with a projecting fin or ring around it, and quite likely the stem of the pile would not be concentric with the lower portion. Another point that should be mentioned is the tendency of concrete piles cast in place to pinch off when other piles are driven alongside while they are still fresh. In some soils this tendency would be increased by expending the pile point into a bulb.

The author states that it can be seen that the pedestal form of file must have greatly increased carrying capacity over the ordinary type. This cannot be contradicted too strongly. Except in very special conditions it is absolutely not so. Boston building laws limits the load carried on a concrete pile 16″ in diameter to 34.87 tons, figured from the compressive stress of 25 tons per square foot. This load can be carried by cylindrical piles. It may be noted in passing that the settlement of ¾-inch under a load of 45 tons, claimed by the contractors as allowable, is rather large.

There are three kinds of concrete piles cast in place in common use:

1. A sheet iron form driven on a mandril, the form left in place and filled with concrete.
2. A tube with iron or steel point driven, filled with concrete and withdrawn, the point left in place.
3. The pedestal pile.

Different conditions suit these different forms. If there are boulders to drive through it is inadvisable to use No. 1. If there is much ground water it is inadvisable to use No. 3. If there is quicksand it is inadvisable to use No. 2 or No. 3, or No. 2 can be used with a premolded pile inserted for part of the length. Under ideal conditions, with no boulders, not much water, and piles of medium length, use the cheapest; but under those conditions, if building a holder foundation, it may be found nearly as cheap, if not cheaper, to build a masonry tank.

MR. NORCROSS told of two experiences with pedestal piles, and agreed with Mr. Cheney in his warning. Their first experience was in a 3,000,000 holder foundation, and it presented no difficulties. It was simply a question of durability and cost. The figures did not indicate that this type would be cheaper than a wood pile foundation with concrete slab and retaining walls, but the question of durability decided us. His recollection is that the concrete pile foundation was figured at about $26,000, and the wood pile foundation and retaining wall about $21,000. The concrete pile foundation was therefore nearly 25% higher in cost. Even when wooden piles are cut to a level supposed to keep them wet there is no guarantee that the ground water level will not change in later years, and that has happened with one of their older holders. Through settlement of the ground, increased filling, more buildings between the river and the holder, the water no longer rises to its former level, and they discovered that a portion of the circumference was resting on nothing, and for that reason decided, regardless of cost, to put in the concrete pile. Having had no experience, they took tenders on several types of concrete pile and awarded the contract in accordance with the price. They did not dig up a pile made for the purpose of photographing, but dup up eight at various points in the circle, without the contractors knowing which ones were going to be dug up; and found them not smooth perfect bulbs like the picture. The bulbs were rough and irregular, but the pile shaft came out of the centre of the bulb and the bulb was large. There was no question in our minds after that examination as to whether the piles were as represented. Their experience with the pedestal pile was so satisfactory in this instance that when they built a new retort house they used the same style of pile for that foundation. It being a vertical retort house, the loads to be carried were extremely heavy. They met the difficulties of which Mr. Cheney warns, and they were very serious. There was a depth of filling, underlying that a strip of mud, and below that apparently good solid sand. There proved to be water pressure in the sand, and the moment we withdrew the core, water and sand filled the casing. We could not get the concrete down, nor make any bulb at the bottom of the pile. After a good deal of experimenting this was overcome by gently feeling for the layer of sand and locating the point of the pile just above it, so that did not pierce the sand and consequently did not get the bubbling spring effect; but the operation was so delicate, and fraught with such uncertainty, that before we went on with the building we felt it necessary to test every pile. We loaded them with forty tons, some with sixty, and found that they settled a little, and then came to a standstill. In only one or two instances did we get a settlement which disturbed us at all, and in that case we reinforced the piling to help out.

MR. KENNEDY had no experience with the pedestal pile. He figured on it and debated it very closely, but funked it. He had watched these piles driven and felt that when you could see the head of a pile rise when an adjoining pile is driven, it did not necessarily follow that the pile was not also shifting in some other direction; and thinks that is the case in all pedestal pile driving. The new holder was close to a canal which undoubtedly is permanent and we know that we have water there for wood piles. We have a smaller holder just a short distance away that is stable.

They figured on a pedestal pile 19 feet long, and in the first analysis the cost in favor of pedestal piling was so little in its favor that we felt it inexpedient to consider it, bearing in mind the large additional cost per foot if we have to go deeper. They found when they drove wooden piles they averaged 35-foot lengths. They put down 4,241 wooden piles, and in some cases there seemed to be no bottom at all. With the pedestal piles what would they have done? He wanted to ask Mr. Drake how the average pile driving figures up in cost to what was estimated. He also was not an advocate of that method of laying the concrete in the slab. He had seen concrete laid where the lower reinforcing bars were lying in the gravel, or rather in the muck underneath. They are the strength of your whole cap, and should not be subject to corrosion. Every inch that they put under the iron beyond that specified would cost some $750, and he would consider nothing less than 2½ inches of concrete under the bars.

MR. READIO said the foundation of their holder was constructed similarily to the one Mr. Drake describes. There was a heterogenous kind of soil, partly ash fill, partly gravel and partly ledge. Two or three hammer casings were buckled trying to get through this ledge. With such a sub-foundation as this, the length of pile would vary greatly, but the average was about 15 feet. While driving the piles he observed one condition mentioned by Mr. Cheney. When a pile was driven in a spot where the soil was porous or could be forced aside, the concrete in the holes already driven would be compressed near the top of the stem, and flowed out, forming a mound on the top of the ground, which would have to be removed before putting on the cap. This necessarily weakened the piles since they would be much thinner right under the cap than in any other part.

MR. DRAKE, in closing the discussion, admitted that he might have been a little too optimistic regarding this type of foundation. However, he still believed that foundation, the type they put in, was best for their needs from a cost viewpoint; and, from an engineering standpoint, just as good as though they went down to hardpan, as well as being far superior to the wooden pile type. The average length of pile driven was substantially as estimated. Test piles were driven at four or five points on the foundation. The soft muck is not quite as thin as that Mr. Cheney spoke of; it is a pasty, clayey material. After you get through the muck there is good solid sand that goes down I don't know how far. Most

of the foundations on the plant are carried down to hardpan, which is a very good grade of sand. The question of a masonry tank was not gone into very thoroughly, as for several reasons they wanted a holder on top of the ground. However, a masonry tank would have cost somewhat more than the form adopted.

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,130,861. Gas Generator. W. P. Tinsley, Fort Worth, Tex., assignor of one-half to J. A. Wisherd, same place.

1,130,940. Process for the Synthesis of Gases. L. L. Summers, Chicago, Ills.

1,130,941. Process for Producing Reactions in Gases and Apparatus for Practising the Same. L. L. Summers, Chicago, Ills.

1,130,984, Gas Burner and Mixer. A. H. Koch, Los Angeles, Cal.

1,131,718. Burner. C. I. Lindau, Pearce, Ariz.

1,131,893. Machine for Making Light Mantles. A. D. Antoine, Chicago, Ill., assignor to C. C. Travis, same place.

1,131,931. Mica Chimney. F. R. Huse, Boston, Mass.

1,132,029. Gas Burner. H. W. O'Dowd, Jersey City, N. J., assignor to William M. Crane Co.

1,132,115. Automatic Gas Shut-Off. F. A. Pickett, Baltimore, Md.

1,132,296. Gas Furnace. J. H. Anspach, Cleveland, O.

1,132,305. Safety Device for Incandescent Gas Light Burners. G. Dalen, Stockholm, Sweden.

1,132,365. Cluster Incandescent Lamp. J. J. Little, Jr., Woodbury, N. J., assignor to Welsbach, Light Co., Gloucester City, N. J.

1,132,485. Gas Lamp Control and Igniter. W. F. Oeftger, Detroit, Mich.

1,132,593. Mercury Loader. E. F. Lloyd, Detroit, Mich.

1,332,594. Apparatus for Recovering Sulphur and Ammonia from Gas. E. F. Lloyd, Detroit, Mich.

1,132,677–78. Device for Trapping Particles in Suspension in Gas Currents. T. E. Murray and C. B. Grady, New York City, said Grady assignor to said Murray.

1,132,685. Coke Oven. A. Roberts, Evanston, Ill.

1,132,722. Gas Burner and Mixer. J. A. Kloeb, Piqua, Ohio.

1,132,933. Apparatus for Distance Gas Lighting. E. W. Havers, London, England.

1,133,010. Apparatus for Generating or Producing Gas. W. R. Degenhardt, Kalgoorlie, and William Jordan, Western Australia.

1,133,071. Gas Feeding Device for Cooking Stoves. A. J. Toussaint, Paris, France.

1,133,265–267. Gas Lighting Apparatus. G. B. Collier, Kinderhook, N. Y.

1,133,266. Gas Lamp. G. B. Collier, Kinderhook, N. Y.

1,133,410. Support or Holder for Lamp Globes or reflectors. S. Snyder, Camden, N. J., assignor to Welsbach Light Co., Gloucester City, N. J.

1,133,460. Gas Floor Furnace. I. G. Cowell, Long Beach, Cal., assignor to J. T. Hunter, same place.

1,133,469. Lamp Inverted Mantle. S. Gulbransen, Woodbury, N. J., assignor to Welsbach Light Co., Gloucester City, N. J.

0,133,470. Incandescent Mantle. S. Gulbransen, Woodbury, N. J., assignor to Welsbach Light Co., Gloucester City, N. J.

1,133,556. Method of Quantitatively Analyzing Gas Mixtures of Known Constituents and Apparatus Therefore. Hans Gerdien, Halensee. Germany, assignor to Siemens & Halske, A. G., Berlin, Germany.

1,133,577. Revolving Grate for Gas Producers. H. Rehmann, Dusseldorf, Germany.

1,133,617. Gas Generator. C. J. Clefton, Owantonna, Minn., assignor to The Clefton Co., same place.

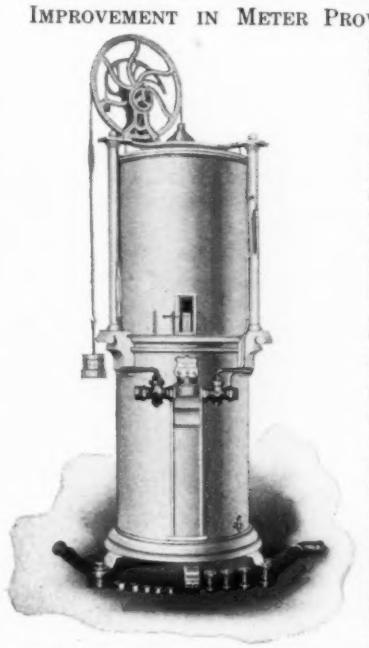
1,133,767. Gas Stove (oven-burner). A. T. Walker, Malden, Mass.

1,133,905. Globe Holder. J. G. Akers and J. Britsch, Philadelphia, Pa.

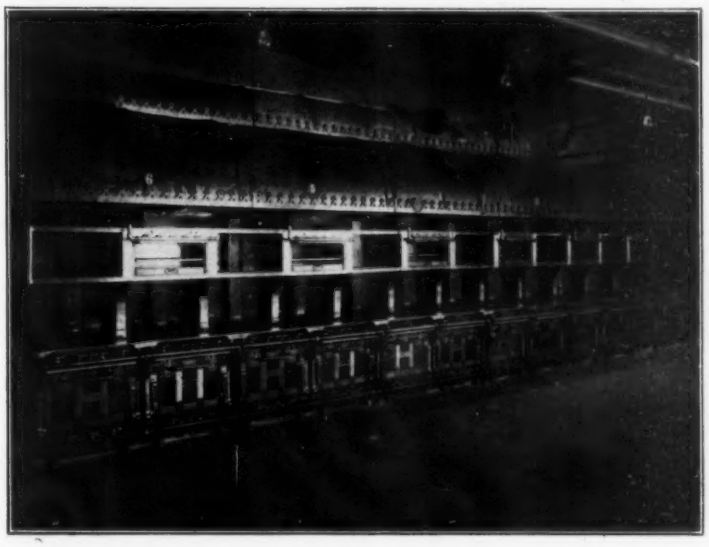
1,133,995. Ash Discharge Device for Gas Producer Grates. Q. Moore, Riddrie, Glasgow, Scotland.

New Methods and Appliances.

IMPROVEMENT IN METER PROVERS.—The last word in meter provers is this design by the American Meter Company. It has hollow steel columns instead of wood; water and air thermometers mounted at same level; syphon gauge on level of the operator's eye; larger hose and cocks; improved air valve; annular water tank; new adjustable pointer; feet with adjusting screws for levelling the prover, and an enclosing jacket around the bell. This last feature is a distinct step for greater accuracy. In the ordinary prover, when the bell is raised from the tank as it fills with air, the sides of the bell are wet and the evaporation of this moisture cools and contracts the volume of air under the bell, reducing the actual volume of the measured quantity. With the jacket added to the bell (it can be applied to any standard prover) the bell is surrounded by saturated air, protected from air draughts, and there is no change in the volume of air under the bell



AN UNUSUAL INSTALLATION OF HOTEL UNITS—This cut is from a photograph of a gas kitchen in the Philadelphia Masonic Temple, showing 12 Vulcan Hotel Units with 6 broilers and 6 high shelves. The method of installing is peculiar. They are connected in pairs and each pair has an individual meter. In order to do this and get them in the space provided, it was necessary to set them close together, as would be done if they were all connected to one meter.



The pairs on the ends are supplied by a pipe running along the side. The four pairs between are connected down through the floor. In all except one case, it was necessary to carry the pipe for the broiler manifold from the back up over the top.

Each section is numbered as shown on the hood, and the various lodges holding banquets at any particular time are assigned one. In this way confusion is avoided, and six banquets can be running at the same time with no question about their proportion of the costs.

SAVING FUEL BY REDUCING SIZE OF STEAM PIPING.—A German electrical works has been experimenting on the transmission of steam through pipes, and reports considerable saving in steam losses by reducing the size of steam mains in order to increase the velocity of flow through them. The old idea was to make the pipes large to cut down pressure loss. The velocity of the steam movement was brought up to 80 to 100 feet per sceond with good results in efficiency of reciprocating engines.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

A FEW weeks ago Superintendent W. A. Leuenberger of the Tacoma Gas Company, Tacoma, Wash., addressed the chemical and domestic science classes of the College of Puget Sound. His address covered the manufacture of both coal and water gas and their distribution, including an explanation of the construction and operation of the gas meter.

THE Tampa, Fla., "Times" says: "Roscoe Nettles doubtless bears the distinction of being the youngest manager of a public utility corporation in the country to-day, being manager of the Tampa Gas Company. His ability and fidelity are best shown by the fact that he is entrusted with such responsibilities, and by the popularity of the gas company with the people of Tampa. Mr. Nettles was practically "born in" the gas businass, his father being engaged in erecting and operating gas plants at Gainesville, Ocala and Orlando at the time of his birth. Twelve years ago, when a mere boy, he became a salesman for the Tampa Gas Company, to the management of which he has risen on pure merit and ability, and not on the strength of 'pull.' He is a live wire in public movements in Tampa, and there is no more enthusiactic Rotarian than he."

DAWAGIAC, Mich., officials are negotiating with Fred E. Lee, representing the owners of the local electric light and gas plants, for the purchase of the two utilities. The companies are known as the Beckwith Estate Electric Light Company and the Dowagiac Gas and Fuel Company. The council recently discussed the proposal, but took no action pending further conference over the purchase price. Submission to the voters at the Spring election of a plan to bond the city for the purchase of the concerns is likely. Mr. Lee has agreed to accept a price named by three appraisers, one appointed by the city, one by himself and a third by the two.

NESBIT LATTA is specializing in field work including main welding and cutting with compressed gas, and the application of explosives to ditching and general excavating.

THE Thomas Roberts-Stevenson Company, manufacturers of Fortune Ranges, has elected these officers: President, R. A. Patton; Treasurer, C. M. Ambler; Secretary, E. E. Pennewill.

"OUR hardest work is to keep our employees from taking colds." Dr. W. E. Post of the Peoples Gas Light and Coke Company told the Illinois Gas Association. "Colds in the head cause more loss of time and money, bring more suffering and deaths, and cut down dividends more than all other diseases combined. They are among the worst enemies of efficiency."

OFFICIALS of the Providence (R. I.) Gas Company announce that as a result of numerous applications gas will be installed in Greystone as soon as the ground can be worked easily. Mains will be extended from Centredale, up Waterman avenue to Greystone.

THE Columbia (Mo.) Gas Company has issued this notice to its consumers: "In view of the fact that the Public Service Commission of Missouri, by its order on February 3, 1915, made such a radical reduction in the gas rates in Columbia for gas furnished on and after March 1, 1915, and that the undersigned felt it could not operate its works profitably under the proposed rates, the company has appealed the decision of the Public Service Commission to the Circuit Court of Cole County, and the court has made an order suspending the operation of the rates fixed by the Commission, leaving the existing rates in effect until decision on this appeal. The court has required a bond of the company so that if the company is ultimately unsuccessful in its contest consumers will have refunded to them whatever they may hereafter pay for gas used after March 1, 1915, in excess of the rates fixed by the Public Service Commission.

THE announcement has been made by the manager of the Westfield (Mass.) Municipal Light Department that Walter S. Watson is in charge of the gas appliance sales department. Mr. Watson was formerly connected with the Consolidated Gas Company of Boston and later with the Gas and Electric Improvement Company of that city, starting as salesman and finally becoming manager of the new business department. He instructed salesman for their various companies located throughout the State, and conducted several selling campaigns with gas and electric shows to familiarize the public with appliances and their uses. Mr. Watson will give his entire attention to building up the gas end of the municipal light department business.

THE plans of the Indiana Coke and Gas Company are rapidly being completed, and the directors have been busy, both in Terre Haute and in the east arranging the details. The directors of the organization for the first year are: Paul N. Bogart, S. D. Royse, M. E. Bradley, Don Duncan, Ora D. Davis, Leon Stern and W. J. Gillispie. The company was incorporated with a capital of $100,000 and its purpose is to sell gas and to market products.

SUPERINTENDENT KNOWLES, of the Richmond (Va.) Gas Works, has figured how the city will profit by refusing to lease the works to a corporation. He estimates the profits on the basis of those for 1914, deducting the difference between 80 and 90 cents per 1,000 cubic feet from the receipts ($56,963.93), and deducting from expenses the unusual price paid for oil the first 8 months of the year ($31,605.41). The tables giving profits under lease operation and under municipal operation shows they would be for the first year of the lease $145,300 and $200,000, respectively, and for the thirtieth year, $154,000 and $490,000, respectively. The total profits for the thirty years under the proposed lease will be $4,039,500, and under municipal operation, $10,350,000. The estimated state taxes on valuation of plant for 30 years to be paid by the city on account of the works being leased is $450,000. Deducting from the profits under municipal operation the amount required in 20 years for improvement of plant and distribution system, $1,330,000, there is left in favor of municipal operation a difference of $4,980,500.

THE Ohio Gas Light and Coke Company, with principal offices in Napoleon, has been granted a franchise in Delta, O., and will commence laying the pipe at once for gas that will be piped from the Napoleon plant. The Napoleon plant and one at Bryson will be enlarged this year and it is expected service will be furnished other northwestern Ohio towns when the improvements are completed. The company has applied to the utilities commission for permission to increase the capital stock from $150,000 to $167,000 and to add $30,000 in bonds to an issue of $153,000 outstanding.

REPORTS are current to the effect that the Niagara Light, Heat and Power Company, of Tonawanda, N. Y., is contemplating the establishment of a dollar rate for illuminating gas in the Tonawandas; although Superintendent C. A. Wallace says he knows nothing of any change in rates.

THE San Angelo (Tex.) Gas Company will hereafter install all service pipes free. This was the announcement made by E. Whitehurst, manager of the plant, and a half page ad. in the local paper tells the full details of the plan. "It does not matter whether the people have bought their stove from us or whether they haven't stoves but only figure on buying them, we are willing to put in the pipes from our mains to the house.

THE Alton (Ills.) Gas and Electric Company is planning to improve the gas service in that city, and also to extend its mains wherever there is prospective business. The North Side people have been trying to get gas for a number of years, and the mains will now be extended to them.

MR. E. W. HANLEY, President of the Dayton (O.) Gas Company, died on March 26. Here is how one paper speaks of him: "Regardless of creed, political affiliation or race, the death of Edward W. Hanley, President of the Dayton Gas Company, and Chairman of the Montgomery County and Ohio Democratic Central Committees, which occurred Saturday in Dayton, came as a shock to the people. Recognized as a valued unit in the citizenship of Dayton, as a man who has been a power for good in the civic affairs of the State, and as a friend, the demise of Mr. Hanley is a personal loss to the people of this city."

THE New Ulm (Minn.) Gas Company reports 260 services installed the first of the year, and 140 orders for services waiting for frost to get out of the ground. It is expected that there will be 700 to 800 consumers before the year ends, and mains will be extended to Sleepy Eye and Springfield villages.

THE employees of the Chattanooga (Tenn.) Gas Company have organized a society to promote education in the gas industry and to affiliate with the National Commercial Gas Association in its work. S. E. DeFrese, General Manager of the company, was elected temporary chairman. The officers chosen were: President, E. J. Darling; Secretary, W. J. Austin, and Treasurer, Claude Morgan. The plans are to at once begin a 3-year educational course, embracing all branches of the gas business. Social features are to be added, and meetings are to be held the second Tuesday in each month. Thirty-five employees joined the organization, there remaining about 20 yet to come in.

THE Wisconsin-Minnesota Light and Power Company will spend upwards of $100,000 in main extensions and main enlargements in Eau Clair. Extensive improvements are also contemplated in La Cross.

WALLACE, IDAHO, is to have a gas plant if the application of John H. Wourms and associates for a franchise is favorably acted upon by the council. It stated that the necessary funds for the construction of the plant are available and that the applicants were ready to proceed at once with the installation of the system. It was not disclosed who the associates of Mr. Wourms were.

THE Beloit (Wis.) Water, Gas and Electric Company has started its spring main laying in the northeast section of the city. The company has a big program of work and expects to push it vigorously.

THE Fall River (Mass.) Gas Works Company, through Manager J. E. Nute, has presented the science department at Durfee a gas meter with glass sides and top, showing the mechanism. This will be of great service, not only for the study of meter reading, but in the general study of gases and testing.

THE City Council of Flint, Mich., has appointed its two representatives to meet those of the Michigan Light Company to determine what shall be the gas rate for the next five years. Under an ordinance passed in April, 1900, "authorizing the erection and operation of gas works in the city of Flint" rates must be re cast every five years. It specifies that "the city shall appoint two disinterested persons and the company shall appoint two disinterested persons, and these four persons shall agree upon a fifth." The ordinance specifies "disinterested persons," but we note that one of the appointees is an avowed advocate of municipal ownership.

AN illustrated lecture on "Coal" was given before the Pittsfield (Mass.) Coal Gas Company's Employees' Association at their monthly meeting held in its hall over the company's offices on North street. Mr. Cooper described the mining of coal and the shipping and marketing of the product; and presented a table compiled by the United States government showing the proportion of the income of the average family spent for necessities of life. It was observed from this table that the average man spent nearly as much for tobacco in a year as he did for coal. Particular stress was laid upon the efforts made to prevent accidents during the handling of coal. A general discussion followed the lecture. A supper and graphaphone concert concluded the evening's entertainment.

THE following are the calorific values specified by Commission rules in the states that have adopted B. T. U. standards:

Monthly Ave. Daily Min.

State.	B. T. U.	B. T. U.	Effective.
District of Columbia..	600	550	July 23, 1914
Indiana.....	600	550	July 1913
Illinois	565	530	Nov. 1, 1914
Missouri	600	550	July 6, 1914
New Hampshire.....	600	550	Feb. 1, 1914
New Jersey.....	600	550	Oct. 17, 1914
Pennsylvania.....	570	520	Apr. 9, 1914
Wisconsin.....	600	550	Aug. 9, 1913

THE home economics department of the Woman's Club of Athol, Mass., held their last meeting with the Girls' Club and the domestic science class of the High School as special guests. Through the kindness of the Athol Gas and Electric Company, a cooking demonstration was given by Miss Carolyn Webber of Boston. Miss Webber's demonstration was "A Company Luncheon." The color scheme of the hall was yellow. In the evening a chafing dish demonstration was given for the Girls' Club and invited guests.

UTILITIES COMMISSION NEWS.

FINGERS SCORCHED.—As a result of a decision of the California Railroad Commission the El Monte petitioners who sought to compel the Southern Counties Gas Company to reduce their gas rate from $1.35, are not only denied cheaper gas but will soon have to stand for a rise. After making an investigation of the company's books and properties the Commission said they were not making as much money as they were entitled to in the El Monte district at the $1.35 rate. The Company had filed a cross petition asking for permission to charge a higher rate, and the commission announced that such permission would be granted.

NO FREE SERVICE TO MUNICIPALITY.—The New Jersey Supreme Court has handed down an important decision setting aside the recent order of the Board of Public Utility Commissioners directing the Public Service Electric Company to furnish free service in the municipal buildings at Plainfield. That company, as successor to the Plainfield Gas and Electric Company, notified the city that it could not continue lawfully to furnish free service heretofore enjoyed. The city, in appealing to the Board of Public Utility Commissioners, held that Section 18 of the public utility law was not applicable to the case, as it permits only unreasonable preference or advantage in giving, and was upheld by the Board in its contention. In the case before the court the commission set forth that the failure of the courts to sustain such a contract would have a far-reaching effect in relieving public utility corporations from obligations assumed under the charter.

In its decision the court says: "The contention at issue clearly ignores the spirit of this legislature. One of its objects was to abrogate the granting of gratuities to municipalities and thereby prevent reciprocal favors being granted to the donors. The evil sought to be eradicated was the insidious influence that might be exercised on municipal bodies and officers, against the general public welfare, by the donors of such gratuities. The Board of Public Utility Commissioners, by the statutes creating the commission, has the power to enforce certain legal obligations upon the company, but the language is not broad enough to confer upon the board the power to enforce specific performing contracts. The order made directs the specific performance of a contract between the parties."

LEGISLATURE INVESTIGATORS NOT FAIR TO COMMISSION.—Commissioner Martin S. Decker, of the Second District, New York, Commission, has filed a statement with the legislative investigating committee in which he says: "In the present investigation no effort has been made to bring out with clearness and with any specification the great amount of work which has been done by the commission and its various members, the character of that work or the results of it as affecting the public interest, and it is therefore impossible for this committee to make any finding whatsoever upon the general efficiency and attention to duty of the commission or its members unless it shall find in favor of the commission as to its general efficiency and attention to duty. In the testimony taken before the committee 7 cases out of 4,000 have been selected as the subject of examination with reference to my work. Three of those cases are mentioned solely on the ground of delay.

ITHACA, N. Y., CONSOLIDATION AUTHORIZED.—The up-state New York Public Service Commission has authorized the consolidation of the Ithaca Gas Light Company and the Ithaca Electric Light and Power Company into the Ithaca Gas and Electric Company. The new corporation will be capitalized at $350,000; of this sum $100,000 will be exchanged for the stock of the gas company, and $100,000 for the common and $100,000 for the preferred stock of the electric company, and $150,000 of the stock of the old companies will be cancelled upon the consolidation.

The new company is also authorized to issue $434,000 of 5% 40-year first mortage bonds; $319,000 of these to be used to exchange, par for par, $254,000 outstanding bonds of the gas company and $65,000 outstanding bonds of the electric company; $115,000 shall be sold at not less than 90 to net $103,500 to fund bills and accounts payable of the gas company to the amount of $74,800.50 and of the electric company $28,556.06.

USING THE DEPRECIATION FUND.—The Central California Gas Company, before the Railroad Commission for the definition of 8% net return, asked the commission these questions: "Will the commission permit the company to use the amount reserved for depreciati n to reduce its funded debt by the operation of its sinking fund? If the answer to the above question is no, then, where will the company be expected to secure the money to retire its bonds as required by its sinking fund?"

Financial Notes.

THE report of the ASTORIA LIGHT, HEAT AND POWER COMPANY of New York for the year ended December 31, 1914, as reported to the Public Service Commission, shows:

Operating revenue	$6,020,045
Operating expenses	4,065,076
Taxes	193,917
Operating income	$1,761,052
Non-operating income	4,318
Gross income applicable to corporate and leased properties	$1,765,370
Interest and rent	357,358
Net corporate income	$1,408,412
Surplus at beginning of year	1,824,552
Total	$3,232,564
Dividends	450,000
Contingent expenses	536,909
Surplus adjustment	47,297
Surplus at close of year	$3,188,358

THE UNITED GAS AND ELECTRIC CORPORATION reports for the year ended December 31:

	1914.	1913.
Net earnings	$1,383,317	$1,184,435
Balance	990,952	882,210
Surplus	200,974	326,022

THE PACIFIC GAS AND ELECTRIC COMPANY has arranged to redeem on April 22, at 100¼% and accrued interest, an additional $1,500,000 of its one year 5% notes. The notes do not fall due until December 15 next, and their early redemption will result in a large saving of interest to the company. After this lot has been retired only $1,500,000 of the issue will be outstading, as compared with $7,000,000 a year ago.

THE STANDARD GAS AND ELECTRIC COMPANY, the principal Byllesby holding company, in its annual report for the year ending December 31, 1914, shows gratifying results for a trying year. The combined income of all subsidiaries for the year was $14,364,689.-07; operating expenses, including taxes and maintenance, were $7,613,455,30, leaving a net of $6,741,233,77. The Standard Gas and Electric Company's proportion of the interest disbursements and dividends of subsidieries amounted to $1,475,029.01, which, together with $465,039.02 of undistributed balance of subsidiaries, makes Standard's applicable income for 1914, $1,940,068.03. After operating expense, interest charges and requirements for 8% dividends on preferred stock there is left a balance of $143,207.32—equivalent to 1.53% on outstanding common stock.

THE AMERICAN GAS AND ELECTRIC COMPANY has outstanding $3,570,000 of common stock and $1,681,000 6% cumulative preferred, all of $50 par value. There are also $6,282,000 collateral trust bonds, some debentures, and various underlying bonds. Earnings have increased steadily since the company was formed in 1907. The common stock is on an 8% basis and an occasional 2% is paid. In view of the fact that the preferred dividend is earned three or four times over it may be considered a fairly conservative investment.

THE annual report of the CITIES SERVICE COMPANY of New York for the year ended December 31, 1914, shows as follows:

	1914.	1913.
Gross earnings	$3,934,453	$2,172,411
Expenses	116,908	85,348
Net earnings	$3,817,545	$2,087,063
Net interest	420,000	123,062
Net in stock	$3,397,545	$1,964,001
Preferred dividends paid and accrued	1,635,993	908,778
Net to common stock	$1,761,552	$1,055,223
Common stock dividends	471,048	466,426
Net to surplus	$1,290,504	$588,797

H. M. BYLLESBY & CO. announce that the board of directors of the Western States Gas and Electric Company of Delaware has declared regular quarterly dividends of 1¾% on the preferred capital stock of the company for the quarter ending March 31, payable April 15 to stockholders of record March 31.

THE LOUISVILLE GAS AND ELECTRIC COMPANY has deferred until May consideration of the dividend of 1½% on the $10,801,300 of preferred stock. Ordinarily the dividend is payable March 1. The company is controlled jointly by the Mississippi Valley Gas and Electric Company and the Standard Gas and Electric Company.

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